73 AMATEUR RADIO

International Edition

JANUARY 1990
ISSUE #352
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A WGE Publication

KING HUSSEIN JY1

Home-brew:

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WELCOME NEWCOMERS

The Spirit of Home-Brew

Almost every day one of us in the editorial office receives a call from an amateur radio operator who's excited about something he's **home-brewing** or **modifying**.

"It may not work as well as a commercial transceiver, but I get more satisfaction out of operating it."

"Everybody told me it couldn't be done, but I'm doing it, and I want to send you an article on it as soon as I'm finished testing it."

"It's just so much fun to use something you've put together yourself. You know it inside and out, and if you want to modify it, you don't have to guess about what's inside."

Our callers are more than excited; often their tone of voice conveys religious joy in the art of creating something that didn't exist before. And what is more religious than creativity—than being a creator, with at least a small "c"?

Sure, the transceiver already existed before our caller built his—but *his* transceiver didn't. It's one of a kind. His transceiver is his baby, and he's proud of it.

Of course, sometimes hams do invent new equipment, such as a type of meter or relay or filter that didn't exist before. Or they use existing equipment and parts in ways that no one else has done before. But whether a ham starts from scratch or just slightly modifies his shiny, store-bought equipment to suit his needs, the feeling of satisfaction is much the same. Only the intensity varies, depending on the person's perception of his accomplishment.

At bottom, the spirit of home-brew is the spirit of **creativity**. Other people know this spirit in other ways, such as in building a house, tastefully disguising leftovers, painting a picture, writing a book, or discovering a new way of doing business.

Modifications are Home-Brew, Too!

How often have you bought a piece of commercial equipment that was absolutely perfect in every respect for *your* needs?

Modifications are popular. In 1989, *73* published 26 articles on modifications for existing equipment, in addition to 78 home-brew construction projects. See the "1989 Annual Index" in the December 1989 issue for a list. The Uniden modifications have been some of the most popular this year. When you look over the "1989 Annual Index," also note that any updates (corrections, additional information, etc.) in following issues are referenced right below the article entry so that you can find them easily.

Many people inherit or buy **CB** equipment which they wish to convert for operation on the amateur radio bands. We receive many requests for copies of CB-to-10 articles, the earliest in this series dating back to May 1977 (end an SASE for a list). Apparently, the early CB-to-10 articles are still useful. Which brings up a point: If you have used the information a CB-to-10 article to modify equipment, please write or call us about the results.

Modifying used equipment is an alternative to buying expensive new equipment. If you enjoy working with tools and the innards of radios, you can customize your equipment and economize at the same time. However, the following warning applies to modifications as well as **repairs**.

Beware of Repairs

Repairing your equipment is another aspect of the home-brew, do-it-yourself way of thinking. Before you take the screwdriver to your new commercial rig to explore the possibility of repairing it yourself, read KB1UM's column on "Fix or Ship?" in the June 1989 issue of *73*. What if you blow it (metaphorically speaking, I hope) and void your warranty? What if, in spite of your best intentions, you not only fail to fix, but further damage, your rig? KB1UM tells you how to decide what to do so that you can avoid trouble.

Check the February, March, and August 1989 "Ask Kabooms" for advice on troubleshooting circuitry, knowing which **components** to suspect first, and how to go about reading schematics.

Essential Tools

Have you ever wished that you knew at least a little bit about construction techniques so that you could change just one or two items on a device? A little change can make a big difference. Maybe you'd prefer an LED to that annoying buzzer.

In the November "Welcome Newcomers," I mentioned *One Evening Electronics Projects,* by Calvin R. Graf and Richard S. Goss, as a good book for beginning construction. It's easy to understand and use. No words are wasted, but neither is it too sparse. Look for it in "Uncle Wayne's Bookshelf" in this issue. The 16 projects include modifications for your telephone, an audio continuity and voltage tester, polarity-sensing continuity tester using LEDs, "probevolt," LED voltage and polarity indicator, poweralert, a light-sensitive audio oscillator, and more.

Since then, I've come across another book while prowling around the bookshelves—*First Book of Modern Electronics Fun Projects,* edited by Art Salsberg and published by Howard W. Sams & Company. It has a good getting-started section as well as some useful electronics projects.

To begin, you need a few tools, some inexpensive parts, and a little knowledge, beginning with safety precautions. Ham books for beginners, such as *Tune in the World,* have photos of components to help you learn how to identify them, and descriptions of their characteristics, properties, and uses. For soldering, see WB9RRT's "Soldering Sidebar" in the August 1988 issue. Check "Tech Tips" for PC board fabrication and other information on how to do things faster, easier, and better. ...de Linda KA1UKM

A Basic Tool Kit

- Soldering iron kit, including a desoldering device.
- Multimeter to measure voltage (in volts), current (in amperes), and resistance (in ohms, represented by Ω).
- IC (integrated circuit) extractor.
- Needle-nose pliers.
- Diagonal wire-cutting pliers.
- Blade and Phillips screwdrivers.
- Set of nut drivers.
- Wire stripper.
- A box for storing junk; i.e., valuable parts, components, and miscellaneous items from diverse sources.
- If necessary: A hiding place to keep your tools so that family members will have to ask before borrowing.
- If possible: A friend with experience and extras, such as an oscilloscope, a frequency counter, signal generator, etc.

Glossary

Amateur Radio Bands You must have an amateur radio operator's license to operate on the ham bands. There are different types of licenses with different privileges. The Novice license requires minimal theory and Morse code at 5 wpm. Privileges for this license include operating on six ham bands—the 80, 40, 15, 10, and 1.25 meter bands; and the 23 centimeter band—in specific modes, such as voice or CW (continuous wave, or Morse code).

CB Citizen's Band; the 11 meter band from 26.965–27.405 MHz. Anyone may operate CB without a license as long as FCC regulations pertaining to this band are observed.

Components Parts or devices in a circuit, such as resistors and capacitors.

Home-brew Do-it-yourself! Practicing creativity.

Junk Potentially valuable miscellany.

Modification You can modify a home-brewed or commercial device. Modifications range from very slight changes in existing equipment to massive overhauling.

PC Board Printed circuit board.

Repair A repair may sometimes be equivalent to a modification, especially by the manufacturer of new equipment for which you have a warranty. Modifications usually void the warranty.

Repairs which make the rig better than it was before it broke down, are certainly modifications. Simple "re-pairs" (for example, you reconnect a spring to a plastic part) only restore the equipment to its original condition.

Rig A ham radio, or transceiver that both receives and sends; a separate transmitter and receiver regarded as a unit.

WHODUNIT

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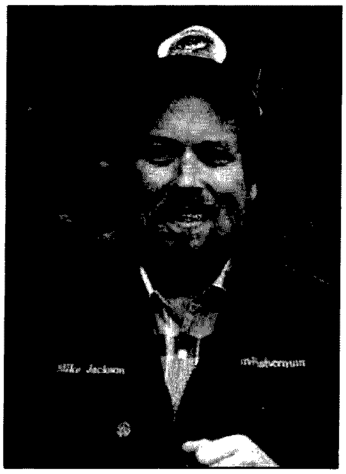

Fish out the story on K9KEJ on page 17.

Cover by Alice Scofield

DEPARTMENTS

FEEDBACK... FEEDBACK!
It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 17. You'll notice a feedback number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*.

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Contract: This is a legal document. Merely by reading this, you are agreeing to get out of your everlasting rut and try something new—like packet or OSCAR. This will keep you from making the Silent Key list without living a little.

Number 2 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1

Ho Hum— No Growth Again

Judging from 99% of the ham club newsletters I read, there's almost zero interest in doing anything about preserving our hobby. Fine, if that's the way you really want it. Though I'll sure miss amateur radio, I've got enough other interests to keep me busy. Like this last weekend, for instance, when Sherry and I zipped over to Munich on a quick business trip.

Unless you're deaf, dumb and blind, you know that the FCC license counts are a disaster. For instance, during the first nine months of 1988 there were 31,000 license renewals. During the same period in 1989 we had 3,300. That's only a 90% drop in renewals, so what's to worry? We need new hams, not those old worn out retreads, right?

After all, Novice Enhancement and the enormous push by ham clubs to license newcomers has been fantastically successful. I know that's true because I read it in another ham magazine—and they wouldn't print it if is weren't true. But where have all these new hams gone?

The FCC figures show us with an actual growth of 0.1%. Well heck, that's a bummer, but I've been reading about the proposed new ARRL no-code license—just wait'll that hits! Sure Like the same deal did in Canada, where in ten years they've attracted less than 100 takers. We're bigger, maybe we can pull in a thousand new hams in ten years.

They tried a similar no-code license in Britain, too. Didn't do much for them either Maybe it's time to give up and sell our gear for what we can while the selling is good.

No-code really worked in Japan, but everyone knows they're smarter and much harder working than we are. They have a tremendous national pride—something we used to have and us old timers still remember with nostalgia. They're working hard for Japan and we're working half-heartedly for ourselves—as long as work doesn't interfere too much with our personal lives. Pass me another six-pack.

The way it looks to me is that the ham club newsletters I read reflect our grassroots. The message is clear: We really don't care. I'm getting the same message loud and clear from 90% of the ham industry, so all this controversy over no-code is just wheel-spinning. Much ado over nothing, to coin a phrase. No-code will only have some meaning if we're going to do something about promoting amateur radio.

Munich

One result of having a couple of darned good assistants is that I have a little more freedom to travel—at least on weekends. On the last few weekends I've been able to get away and give talks at the Huntsville and Louisville hamfests, go to Los Angeles for a Kenwood new product unveiling and I even went on a scuba-diving Caribbean trip. I'll put the story of that trip on the *73* BBS, in case you're interested in diving. It would take up too much room in 73, even though I know you'd enjoy my adventure.

So what about Munich? Well, a couple weeks ago there was a story on PBS radio about the new dance craze in Europe, the Lambada. I noted this for my wife, Sherry, who produces how-to-dance videos. A week later she saw the Lambada on a TV news report and decided it was getting time to produce a video.

Kathy, the star of her videos, had never heard of the Lambada—and worse, was unable to even find a dance teacher who knew how to do it. Well, it's popular in Europe, so let's go over and video tape some people dancing it so Kathy will be able to do a video.

I got in touch with some publishing friends in Munich and the next day we were on our way. We arrived Saturday afternoon and had our video done before midnight. We even found a dozen Lambada CDs in the local record stores!

The Lambada is a mixture of dirty dancing, the samba, bossa nova, tango, cha cha and a few other Brazilian dances. I interviewed a Brazilian dance teacher in Munich and was promised an article for my music magazine on it.

When I saw how enthusiastically the otherwise staid Germans went for the dance, I knew it would be big in America. I went along to help Sherry do a video, but I ended up deciding to import Lambada CDs and cassettes. They'll sell like crazy in a few months. And I'll bet Sherry's how-to video will be the best seller of her 60+ videos.

The dance is great fun, real easy to learn, and it's the closest thing to the sex act on the dance floor. The kids (of all ages) will love it.

Nope, no hamming. I'm going back in mid-February to Munich and then driving to Vienna, Crakow and Prague. I hope to meet ham groups then. Maybe you can help?

I'll be in London for the Thanksgiving long weekend. In January it's CES in Las Vegas, the annual ham skiing bash in Aspen (9-16th), then Cannes for a music conference at the end of the month.

I'll be in L.A. March 9–13th for a music conference, if there are any clubs who need an exhausted old ham speaker. Mobile (AL) April 5–6th for my Drum submarine reunion. Dayton the 26th. May 29–June 2 Nashville for another music conference. Chicago June 3-5th for CES. That's about all I've got on my 1990 dance card so far.

There's a fantastic scuba trip to a virgin reef in the Bahamas coming in July if you're into diving. I'm hearing from more and more ham divers interested in my organizing combo diving/ham visits to the rarer Caribbean Islands. Are you game? Want to cope with pileups?

With all that travel I won't have time to get to many hamfests—and even fewer ham club meetings. If your club would like to have me speak, here's how we can do it. I have a couple of 8mm video cameras here, so if you'll write down some questions that you'd like to have me answer or topics you'd like me to talk about, I'll get together with Jim Morrissett K6MH and we'll video my answers. We'll then copy the 8mm to VHS for you and send you the tape. I don't know how long it'll be—could easily run an hour.

The video quality won't be all that great—and I'm not about to spend $3,000 more to buy two new High-8 cameras so you'll get broadcast quality. But it'll be pretty good. It should be interesting meeting entertainment for you. Better than some guy from Public Service.

Send me $20 and your list of topics. That'll cover the blank tape, packing, mailing, with a little left for eventually buying better video equipment in case this gets popular.

I can talk about the time when we came "that close" to losing amateur radio. I was there, so I know what happened. I can talk about how hamming was fifty years ago—which you probably already know. I can talk about new ham technologies which can be developed. I can talk about education, welfare, drugs, the China mess, how to save amateur radio, entrepreneurialism, cutting college costs, no-code, how microcomputers got started, how Radio Shack saved IBM, why IBM is now in trouble, how Texas Instruments blew $800 million and threw away billions, how the Incentive Licensing disaster happened, the latest in low magnetic field developments, communicating with the dead and with alien civilizations, EMP, how life started, how the mind works, the old RTTY days, how hams started cellular radio, how repeaters got organized, how to clean up our bands, how to put K1MAN and KV4FV out of the jamming business, etc. What'll you have?

With some encouragement I'll build up a library of video talks which you'll be able to use to further discourage kids from coming to your club meetings.

Killer Blankets II

Dr. Ross Adey KU6I, in his presentation at the 1989 ARRL SW Division Convention on the effects of low energy 60 Hz magnetic fields on our bodies, had an interesting comment to make about the press: ". . . when the press says that this is controversial, what it really means is that the reporter is too uneducated and too stupid to understand what he has been told."

The November *Consumer Reports* devoted two pages to discussing the dangers of using electric blankets—and four pages to rating comforters to use instead. In case you don't read *CR* (tsk), one of their top recommendations is the L.L. Bean #8406KK at $84. They also gave good grades to Springs Performance Jeweltone Solids at $33. They found that goose down filling was no warmer than synthetic-filling, only a whole lot more expensive. That's good news for allergy-prone people like me.

By now, unless you are truly insulated from the real world by functional illiteracy (you can read, but you don't bother), you've been reading an increasing number of articles on the dangers of magnetic fields—such as in the Oct. 31st *Business Week*.

I also recently read an interesting article on experiments with animals which have been oriented away from the Earth's magnetic field, with some startling results to their development even with as little as five degrees off the north-south axis.

Getting back to Ross, he's right about the press—a distressingly high percentage of reporters are woefully uneducated. This put me in mind of the hams who meet me and start out by saying, "Well, I don't always agree

Continued on page 68

QRX. . .

EDITED BY BRYAN HASTINGS NS1B

Double Dayton

Japan Ham-Fair '89 turned out to be one of the largest amateur radio gatherings ever held. Approximately 58,000 attendees from 14 nations visited this massive ham convention, held August 25–27 at the New Hall of the International Trade Center in Tokyo, Japan. The list of dignitaries included IARU President Richard Baldwin W1RU and Chinese Radio Sports Association Vice-President Cheng Ping BZ1CP.

SP Now Mobile

Polish amateurs are now allowed to operate mobile, it was announced at the recent SP DX Convention in Warsaw. Eventually, mobile operation will be a normal part of SP licensing procedures, but right now Polish hams must have a license endorsement to use the new privileges. Packet is also expected soon, with a new SP Packet organization officially formed during the DX gathering.

OSCAR 13 Suffers Second Hit

OSCAR 13 was again put off-limits to general ham use on October 29. AMSAT-DL in Germany sent an urgent notice to all satellite users that apparently solar radiation has again corrupted the Internal Housekeeping Computer on the satellite. A-O-13 had the same problem a few weeks ago and was down for almost a week. Graham Ratcliff VK5AGR in Australia will attempt to re-start the computer. He will keep everyone posted on the condition of the bird.

In a related matter, Ross Forbes WB6GFJ of Project OSCAR informs us that the North American DCE Gateway now functions on incoming traffic only. Some of the gear was destroyed during the recent San Francisco earthquake. The equipment will soon be replaced.

Autopatch Phone Bates

California hams who own autopatch repeaters may soon be getting a welcome surprise from Pacific Telephone. Word is that the company will soon change the service for amateur autopatches from commercial rates to residential rates. The exact date for the change is unknown, and it applies to Pacific Telephone customers only. If your autopatch is on General Telephone, you will have to wait a while longer to see how they respond to the Pac Tel policy change.

VE-land Changes

Canada should have its revised amateur radio licensing structure in place within a year. All indications are that things are on schedule with the DOC Regulations. The syllabus and question banks are expected to be ready in March of 1990. The new regulations will be promulgated for several months before implementation of the restructured Canadian Amateur Service takes effect in September.

Micronesia

On October 12, the United States and the Federated States of Micronesia (V63) entered into a Third Party traffic agreement covering amateur radio. The agreement permits hams in both nations to relay personal messages on behalf of the citizenry. In addition, the agreement stipulates that when public telecommunications are not available, as in a disaster, communications relating to the safety of life and property may be handled by amateur operators in the two countries. Commercial messages are prohibited.

Brando

One of the nation's leading authors is looking to ham radio for help in his next book. Peter Manso is the author of *Mailer, His Life and Times* and other bestsellers. Manso has won countless awards for his work, and now he has undertaken to write about one of the world's best known actors, Marlon Brando.

Brando, an amateur radio operator, held several callsigns over the years, including WA6RBU and FO0GJ. If you have ever worked Brando under any of his many callsigns, and if you have a vivid recollection of the contact, Peter Manso would like to hear from you. Write him at PO Box 668, Truro MA 02666. Also, see the classified ads in the November issue of *QST*, page 180, for more information.

Instant Track Delayed

Deliveries of the new Instant Track program information from Project OSCAR were scheduled to begin on 1 November, but they've been delayed. If you ordered it before that date, you will eventually receive a flyer with information about the program. They were assembling the mailing in Los Altos Hills, California, on the day the area was hit by the 7.1 magnitude earthquake. Shipment is now being resumed.

Attention All Parents, Teachers and Students

The nominating period is now open for the 1990 *Westlink Report* Young Ham of the Year. The award, widely supported by industry, is given annually to a radio amateur, 18 years of age or younger, who best epitomizes the accomplishments of youth in amateur radio as related to community and amateur radio service on a local, regional, or national level; promotion of international goodwill through amateur radio; promotion of high ethical and moral values through amateur radio; education through and/or with amateur radio, or any combination of the foregoing.

To qualify, a candidate must hold a valid FCC Novice class or higher amateur license, be a resident of the United States, and attend an accredited learning institution. Letters of nomination are due no later than 1 May 1990 and must be detailed, accurate, and contain substantiating data to any and all claims made. The 1990 award presentation will take place at the ARRL National Convention in Kansas City in June 1990. Send nominations and substantiating documentation to 1990 Young Ham of the Year Award, *The Westlink Report*, 28197 Robin Avenue, Saugus CA 91350.

Fuji Off Line

The Japan Amateur Radio League (JARL) has announced termination of the operation of Amateur Satellite JAS-1/FUJI-OSCAR 12 effective November 5 because of low power generation.

Japan plans to launch its second amateur satellite, JAS-1B, in February 1990. To help publicize the event, the JARL recently placed special events station 8J6JSB into operation on all of the HF bands. It's operational from 1400–2000 UTC weekdays, 1400–2200 UTC on Saturdays, and 1000–2200 on Sundays and holidays.

Extra Quake Activity

WD6BPT at the St. Judes Hospital and Rehabilitation Center in Fullerton, California, was activated following last month's Northern California earthquake. The station came on at the request of the National Disaster Medical System. Manning the station, WA6OPS and N6FSL spent a day obtaining the status of hospitals in the affected area for the NDMS coordination center in Minnesota and the national headquarters of the Red Cross.

Out of Data

Zenith has dumped out of the PC market. The last of the truly "domestic" US manufacturers of home electronics has quieted speculation that it was backing out of the consumer market by selling its computer division to the Groupe Bull of France. The company says it will now concentrate on home entertainment and allied markets.

Thanx. . .

. . .to all those who contributed to this month's QRX. They are: *Westlink Report*, JARL, AMSAT-NA, CRRL, ARRL, GB2RS, JRRL, Telex, and Broadcast Television Magazine. Keep your photos and news items rolling into QRX!

The King and Us

King Hussein VE6JY1 and the royal family visit Alberta, Canada.

by Ken McGregor and Victor Post VE6VIP

When Victor Post VE6VIP heard that King Hussein JY1 was on his way to Alberta, he quickly got a group of Canadian hams together to organize a welcoming reception, with the approval of the Chief of Protocol and the Premier of Alberta. At VE6VIP's request, Ray Flat, regional director of Communications Canada in Edmonton, assigned the king the Canadian callsign VE6/JY1.

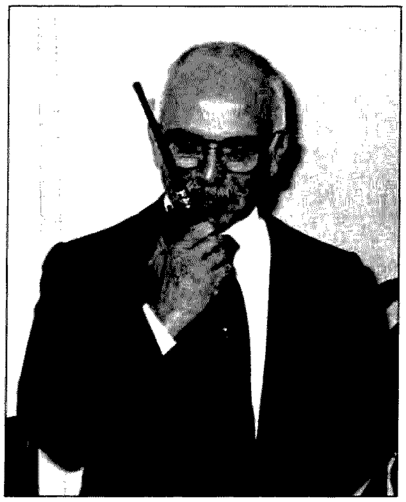


Photo A. King Hussein VE6/JY1 tries out his new FT-411.

VE6VIP, Norm Waltho VE6VW, and others, contacted local amateurs who could attend the reception. Soon they had invitations and name tags printed up, accommodations reserved at the Palliser Hotel in Calgary, and a buffet arranged for the reception. VE6VIP made and framed a 11" x 14" QSL print of Morraine Lake, superimposed with the king's call letters, then made 8" x 10" copies for attendees of the reception.

Roll Out the Red Carpet

King Hussein arrived on October 13, 1989. Victor VE6VIP, official photographer for royal tours, drove his car throughout the tour with his Kenwood TS-440S at the king's disposal. When the king, queen, and prince went for a walk at Lake Louise, the king took advantage of VE6VIP's mobile unit. Len Kochan VE6LEN, net controller in Edmonton, had a pile-up as soon as the king said "73" into the microphone. Amateurs from all over the country tried to catch a word with him. At this time, the king operated under Post's callsign and his Jordanian callsign.

Two days later, King Hussein attended the reception held in his honor. He shook the hand of every amateur who attended. Paul Neufeld, Calgary regional director of Communications Canada, presented the king with the framed permit, giving him the callsign VE6/JY1. Victor Post VE6VIP then presented the king with his framed QSL card and the Yaesu handheld, contributed by the local hams and Alfa Communications. As King Hussein received the HT, VE6PA's voice came over the speaker, welcoming him to the air, using his new Canadian callsign.

After takeoff, King Hussein QSOed Canadian hams on 20 meter USB.

King Hussein's visit did more to rejuvenate local interest in amateur radio than any other event in recent history. VE6VIP and the amateurs of Alberta thank His Majesty, King Hussein VE6/JY1, for his participation in the reception, and for publicly affirming his interest in amateur radio.

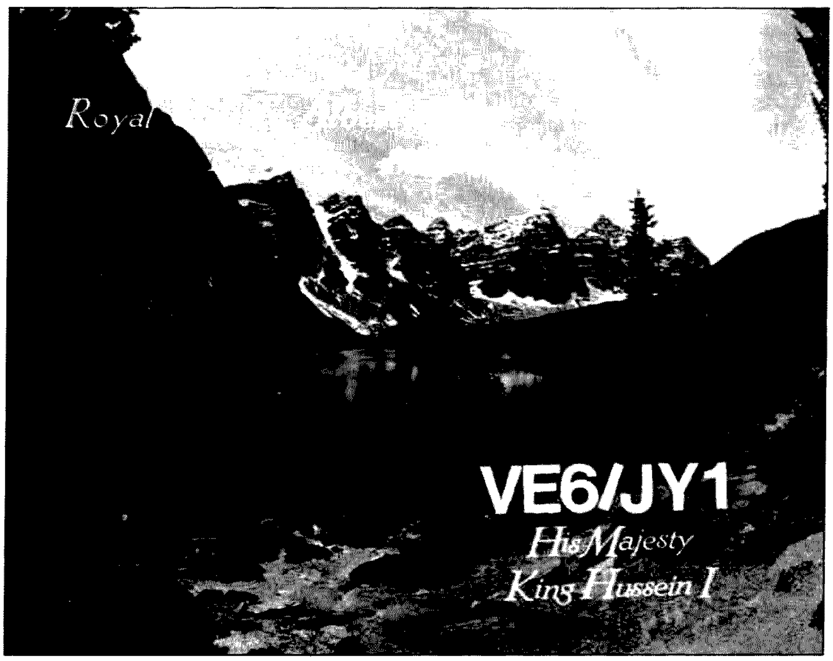


Photo B. Victor Post VE6VIP's memorable QSL to King Hussein.

Poor Man's Service Monitor

FM experimeters take note!

by William D. Crowl N6MWS

Photo A. Inside details of the Poor Man's Service Monitor. Note the clean modular layout.

A communications service monitor? For those of you not familiar with this device, it is the stock-in-trade test instrument for commercial radio service technicians, and I'm fortunate enough to have access to one at work. The most complete monitor includes a precision RF generator with an output attenuator, a spectrum analyzer, an oscilloscope, a well-instrumented scanning receiver, and a wattmeter, all in one portable instrument hardly larger than an ordinary oscilloscope.

A service monitor is also extremely expensive, and it's rare for the average amateur club, let alone the individual amateur, to have access to one. Even in my case, access is limited, and I never have as much time with the instrument as I would like. Therefore, I built the Poor Man's Service Monitor.

Practical Uses

While I knew that the precision RF generator and spectrum analyzer were beyond my home-brew skills and budget, the well-instrumented scanning receiver wasn't. I already had an oscilloscope, a frequency counter, and a wide coverage scanner. Using a few op amps and a pair of analog panel meters, I decided it should be possible to build the frequency error and deviation meters the professional service technician uses to set up the transmitters he services.

This device, together with an oscilloscope and a frequency counter, will allow you to make all kinds of radio system tests that ordinarily are beyond the capabilities of most amateurs. By connecting a counter on the Demod Tone output, you can easily see if your tone encoder is on frequency. An oscilloscope connected to the Demod Audio output will allow you to view the actual recovered audio before the audio processing circuits in the scanner get in the way. If you're curious about how digital paging works or what that funny racket you hear on some obscure frequency is, this is the tool for the job. Likewise if you want to add a DTMF or subaudible tone encoder to an older radio, but were afraid to try because you couldn't test it.

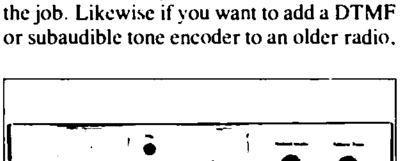


Photo B. Front panel of the Poor Man's Service Monitor. The optimum full-scale ranges for the Frequency Error and Deviation meters are 10 kHz (5 kHz of either side of center frequency), and 0–6 kHz, respectively.

FM packeteers can also use this tester to optimize the audio level output from the TNC going to the transceiver, usually adjustable by a trim-pot on the TNC. If this drive is too low, the signal deviation is unnecessarily low, reducing throughput. If the TNC drive to the rig is too high, the deviation will either exceed the legal channel limits and interfere with adjacent channels, or the rig's limiter will distort the overdeviated signal, also reducing throughput. The mark and space deviation should not exceed 3½ kHz.

Repeater owners will also find this useful for similar reasons—to maximize the NBFM voice signal deviation without going out of channel, and ensure that the signal is centered right on frequency. In fact, any ham who transmits on FM, such as HT and mobile ops, can use this tester to maximize their output signal and make sure that signal is properly centered.

Circuit Description

After considerable experimentation, I came up with the circuit shown in Figure 1. While this device is certainly no complete service monitor, it goes a long way toward giving the average amateur an idea of what is going on with his rig or any other transmitter he cares to listen to on the air.

Since 99% of the circuitry was already there, I included a remote control stop/start signal for a tape recorder. This output allows you to eliminate the dead air you would ordinarily hear during a net or preparedness drill recorded for later analysis.

In this project, I emphasize simplicity and low cost. After studying the output from the demodulator IC in my scanner, it became plain that the signals it produced weren't quite commercial test equipment quality—but are fine for the home experimenter.

This two-chip design uses the LM324 op amp IC because of its low cost and availability. In fact, I bought everything for this project, except the panel meters, at Radio Shack. (Two good construction aids are the *National*

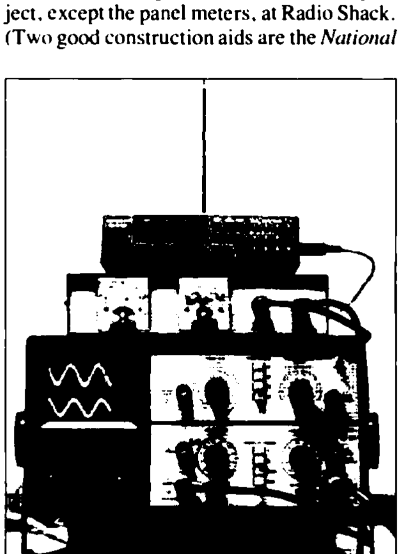


Photo C. From top to bottom: scanner, TPMSM, oscilloscope, and frequency counter. The Poor Man's Service Monitor is testing the output of the author's handheld. Note the DTMF signal on the oscilloscope (the HT feeds a dummy load).

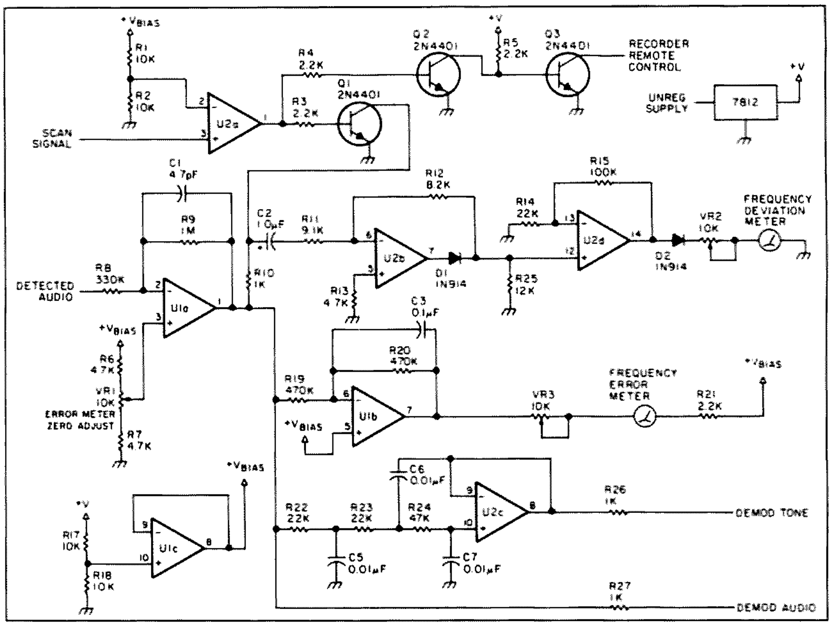


Figure 1. Schematic of the Poor Man's Service Monitor.

Semiconductor Linear Databook and *Electronic Design With Off-The-Shelf Integrated Circuits*, by Meikin and Thackray.)

I found the meters at a local electronics junk shop. The best meters have a full scale deflection current of between 100 µA and 1 mA. Meters with current ratings outside of that range have high current requirements or problems with response speed.

The details of the actual circuit are pretty simple. U1A, a buffer amplifier, establishes the proper DC offset for the rest of the downstream amplifiers. It is also a first order low-pass active filter with an fc (corner frequency) of about 400 kHz. (All frequencies above the corner frequency are attenuated by the filter; all those below the fc are left unattenuated.) The gain of this stage was based on the performance of Motorola's MC3359 narrowband FM demodulator IC. (See the Motorola Data Sheet for the MC3357 and MC3359 ICs.) This chip produces a 0.3V DC output signal per kHz of signal deviation. Since I wanted to see more than 5 kHz of deviation, the maximum gain with a 12V DC supply was limited to three times the input signal.

U1B is also a low-pass active filter, but its fc is so low it might as well be DC, and that is, in fact, what its application is here. The output of U1B, a DC signal, directly tracks the average DC output of the demodulator IC. If the carrier signal goes higher (or lower) than the desired frequency, the DC output of U1B does also.

This signal is referenced to a bias signal generated by U1C. The frequency error meter will move to the left or right of center if the transmitter frequency is not centered on the selected channel. Use VR1 to zero adjust the frequency error meter and VR3 to calibrate full scale deflection.

U2C is a third order, low-pass active filter with an fc of about 350 Hz. The output of this filter is used to monitor subaudible or (CTCSS) tone signaling. This is very handy for tuning and testing subaudible tone encoders (see sidebar). You can connect either a frequency counter or an oscilloscope to this output.

U2A, a comparator, buffers the scan signal from the demodulator IC. This signal causes Q1 to shunt the audio from U1A to ground through current limiting resistor R10 when the receiver squelches. If this weren't done, the frequency deviation meter would be hammered against the stop whenever carrier was not present.

Deviation Meter Driver Circuitry

U2B is a simplified, active full-wave rectifier. This circuit has the advantage of eliminating the 0.6V forward drop characteristic of silicon rectifiers. When a positive voltage is present at U2-6, it passes around the amplifier to U2-12. U2B amplifies and inverts a negative voltage and also passes it along to U2-12.

To keep the positive and negative peaks the same amplitude, the choice of resistor values for R10, R11, R12, and R25 are critical. Don't make any substitutions unless you know what you are doing. This change in output impedance between positive and inverted negative voltage peaks means that U2D must buffer and amplify the rectified modulation signal to a level that will drive a meter movement.

Diode D2 provides 0.6V of "quiet" offset in the modulation meter signal. If the received signal is just a little noisy, the voltage drop across this diode will prevent the meter from interpreting the noise as modulation. Calibrate the frequency deviation meter with VR2.

Recorder Remote Circuitry

Transistor Q2, an inverter, gives Q3 the proper polarity for operating a tape recorder

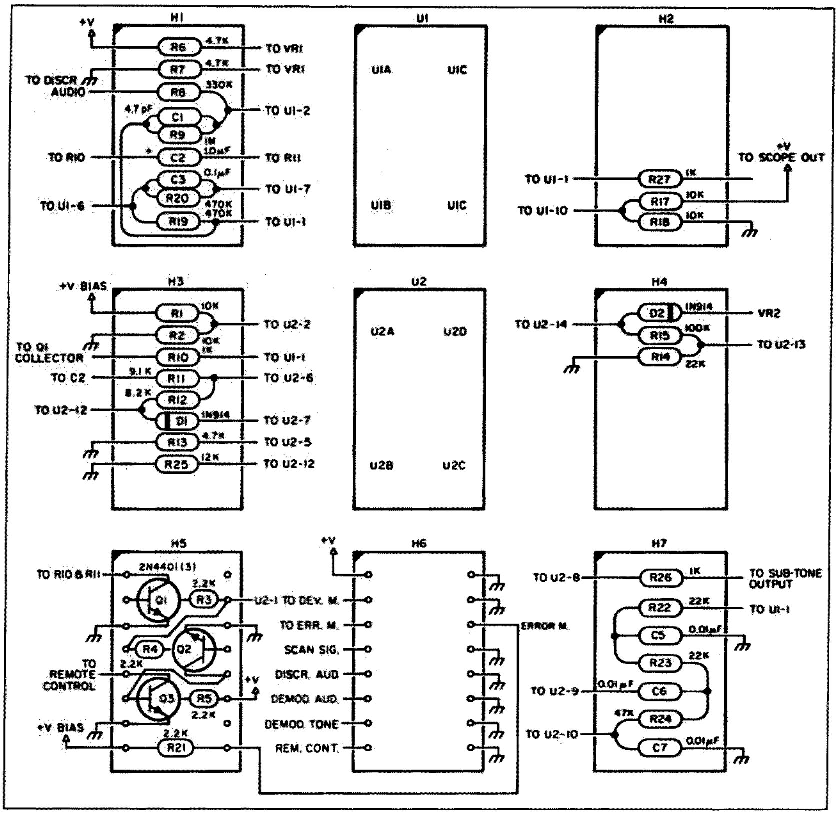


Figure 2. Parts placement for the Monitor.

remote control input. When Q3 is conducting, the tape recorder will record. When it's open, the tape recorder will stop. This part of the circuit was a "gimmie"; almost all of the circuitry required to implement it was already there. If you have no use for this circuit, feel free to eliminate Q2, Q3, and associated resistors.

Construction

First evaluate the scanner you want to use as your test receiver. Almost all currently produced low cost narrowband FM receivers use the Motorola MC3357 or MC3359 IC for the low IF and demodulator circuit. Occasionally it's hard to identify this IC since the part number is disguised by Oriental manufacturers. Usually the 3357 or 3359 will be a portion of the part number even if the MC is not. In extreme cases you may have to either compare the pinout from the Motorola data sheet to the schematic of your scanner, or look for a 455 kHz ceramic filter near a likely IC, to find the right device. If your scanner has the Motorola IC or a foreign made clone, you don't even need a schematic of your scanner to do this project. You need only to bring three signals from the scanner, and all three are available on the demodulator chip. If you have the MC3357 (16-pin) chip, the Ground, Scan, and Audio are pins 15, 13, and 9, respectively. For the MC3359 (18-pin) IC, these pins are 17, 15, and 10.

I brought all three signals out of my scanner with a ⅛" stereo jack and built a cable to connect the test set to the scanner. This left the scanner free for other uses when not used as a test receiver. It's best to connect the receive audio to the tip, scan signal to the ring, and ground to the shank. Make the connection to the scanner only with power off, to prevent damage from the momentary short that will occur when you plug in the test set.

Modular Convenience

I built my prototype on a small card for digital projects and mounted all my parts on headers. (A header is a pin platform that inserts into an IC socket to allow components to be easily mounted to that socket.) I highly recommend this approach for two reasons. First, if you use the interleaved power and ground traces that pass down the middle of each IC pin pattern, you can make solder bridges for power and ground connections. If you make all the power and ground connections before you wire the circuit, you'll have a neat, easy-to-troubleshoot device with very low impedance power and ground connections. This helps a lot with noise immunity, something to consider with a transmitter operating nearby. (Don't forget to include a couple of 0.01 μF power-to-ground bypass capacitors, too.)

Second, mounting the parts on headers makes the project modular and easier to construct over a period of time. You can build each module in an evening, after the kids go to bed, without leaving anything hanging.

Not shown on the schematic are the power

Continued on page 77

Parts List for the Poor Man's Service Monitor

Qty.	Description	Part Number	Desig.	Price Ea.	Ext. Price
2	LM 324 Quad Op-Amp IC	276-1711	U1-U2	1.29	2.58
1	7812 12vdc 3 terminal reg.	276-1771		1.19	1.19
3	2N4401 NPN transistor (TO-92)	276-2058	Q1-Q3	.49	.98
2	1N914 small signal diode	276-1122	D1-D2	.94	.94
3	10kΩ 15 turn potentiometer	*271-343	VR1-VR3	1.49	4.47
4	10kΩ 5% CF resistor	271-1335	R1-R2,R17-R18	.39	.39
4	2.2kΩ 5% CF resistor	271-1325	R3-R5,R21	.39	.39
3	1kΩ 5% CF resistor	271-1321	R10,R26,R27	.39	.39
1	330kΩ 5% CF resistor	*29SJ250val	R8	.08	.40
1	1MΩ 5% CF resistor	271-1356	R9	.39	.39
3	4.7kΩ 5% CF resistor	271-1330	R6-R7,R13	.39	.39
2	470kΩ 5% CF resistor	271-1354	R19,R20	.39	.39
3	22kΩ 5% CF resistor	271-1339	R14,R22-R23	.39	.39
1	100kΩ 5% CF resistor	271-1347	R15	.39	.39
1	9.1kΩ 5% CF resistor	*29SJ250val	R11	.08	.40
1	8.2kΩ 5% CF resistor	*29SJ250val	R12	.08	.40
1	12kΩ 5% CF resistor	*29SJ250val	R25	.08	.40
1	47kΩ 5% CF resistor	271-1342	R24	.39	.39
1	4.7 pF 50 WVDC cer. capacitor	272-120	C1	.39	.39
1	1.0 μF 35 WVDC tant. capacitor	272-1434	C2	.49	.49
3	0.01 μF 50 WVDC capacitor	272-1065	C5-C7, Bypass	.59	1.18
1	Digital project perfboard	**JE403		9.95	9.95
1	Deluxe project box	270-272B		8.49	8.49
2	Panel mount BNC jack	278-105		1.39	2.78
2	Panel mount ⅛" stereo jack	274-250		2.19	2.19
1	500-0-500 microammeter 3½"	*541-MS-DUA-5H5			17.00
1	0-10 milliammeter 3½"	*541-MS-DMA-010			16.00

Notes on parts list:
1. All part numbers refer to Radio Shack catalog part numbers unless otherwise specified.
2. * Indicates part available from Mouser Electronics, 1-800-346-6873.
3. ** Indicates part available from Jameco Electronics, 415-592-8097.

Number 6 on your Feedback card

HAM PROFILES

There are no "average" hams!

Mary Seferaj KB2IGY.

Tune In To "Iggy"

Mary Seferaj KB2IGY, 13 years old, is in the 8th grade at Intermediate School 72 in Staten Island, New York. Mary visits the ham radio classes of Carole Perry WB2MGP, her former teacher, to tell the youngsters in the program what fun they have to look forward to when they get their licenses.

Every morning at 7 a.m. Mary goes to the hamshack in WB2MGP's classroom to talk to her new friends on the 146.88 repeater and on the local 220 repeaters. The local hams have given her the nickname "Iggy" because they love to hear KB2IGY on the air each morning.

Mary is also a frequent operator in the "CQ All Schools Net" run by Gordon West WB6NOA and Carole Perry every Tuesday and Thursday at 17:30 UTC on 28.306 MHz. Joe N6CRX, one of the West Coast net controls, has often complimented Mary on her enthusiasm and her fine operating procedure. She is a great role model for the other students in the ham radio program.

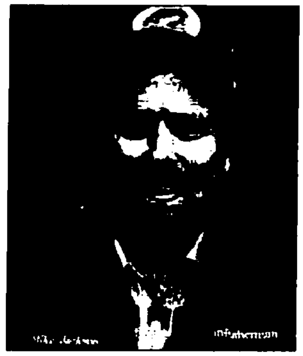
Mary wants to be a pediatrician when she grows up. Right now, her other interests include playing soccer and bicycle racing.

Mega-Talented Ham

Six o'clock on Sunday mornings may find some folks still fast asleep, but devotees of hunting, fishing and camping in Illinois, Wisconsin, Indiana, and Michigan, will be found tuned to WCBR 92.7 on the radio dial, listening to the "Mike Jackson Outdoors Show." Not many of his listeners know that in addition to being an authority on saugers in the Kankakee River, walleyes in Petite Lake, grouse hunting and a myriad of other sporting facts, "Mike Jackson," (real name is Orrin Brand K9KEJ) is a man of many talents and trades.

Orrin got his first amateur radio license at age 12. While attending high school, he often demonstrated electronics and elementary amateur radio stations at science fairs. Orrin, who has his B.A. degree in journalism and communications, has been involved in radio, film, and theatre in many ways since the 60s, including stage and screen acting and comedy-writing, and as a radio announcer, news director and anchorman.

In 1973 he returned to Chicago to take over a family-owned printing business and at the same time started an advertising business. All during this period he wrote prolifically for outdoors publications. Since 1980 he has been in marketing and advertising with his own firm, Brand Communications, specializing in consumer and industrial accounts.



Orrin Brand K9KEJ.

Orrin loves to fly, and has flown aircraft within the Arctic Circle. He is also a professional photographer who exhibits and sells his own prints once or twice a year and voraciously reads three newspapers a day and two books a week.

Orrin has two daughters, Melissa and Stephanie, aged 19 and 21. He and his wife Charlotte and their seven-year-old daughter Debbie live in Buffalo Grove, Illinois. (Biography by Angelo Polvere KA9CSO.)

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

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To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

The 1¼ Meter Serendipity Antenna

Gives its commercial brothers a run for their money.

by John M.C. Wilson KA1LCC

One rainy Saturday afternoon while I was practicing code, it occurred to me that it would be handy to have a 1¼ meter antenna for simplex operation around town. Since I live near Pack Monadnock mountain, atop which sits the central node for the New England 220 MHz Network, a rubber duck and 150 mW gets me into all six New England states and New York! In fact, I can copy the Pack repeater with no antenna at all! Simplex operation, however, was more conducive to leisurely rag-chews.

As usual, I was short of funds for radio projects, so I began to think about a home-built antenna. I suddenly remembered that there was an old Bearcat monitoring antenna in the attic that might be modified for my purpose. I stopped the code practice (not a difficult decision) and happily went to work on the project.

Favorable Features of the Bearcat

The monitoring antenna had the following qualities that made it suitable for the purpose: a very rugged base plate and mast clamp; very good quality aluminum tubing ground planes; and a whip antenna mounting, adjustable with a set screw. The tall plastic housing from which the whip protruded suggested a loading coil, as did the rather impressive 25 to 512 MHz coverage mentioned on the data sheet.

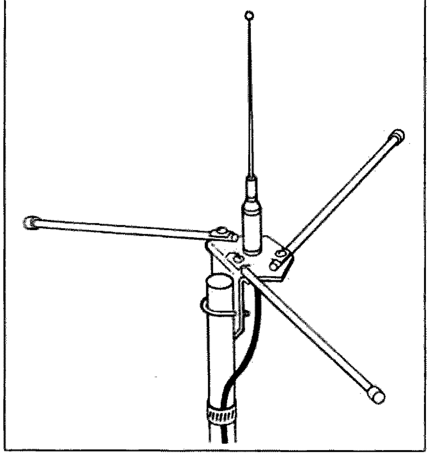


Figure 1. The Bearcat as a wideband monitoring antenna...

> *"The construction project was a lot of fun and cost me nothing. . ."*

The Mod

The first step was to remove the loading coil. Since the coil was cemented inside the plastic tube, I had to saw it open near one end. I then removed the coil, and soldered a short length of the coil wire to the connection coming out of the SO-239 type connector. I reassembled the now-shortened plastic tube and antenna holder, using press fitting and cement.

The whip antenna was next cut to 12⅝", but this measurement had to be taken from the bottom of the plastic support because there was nothing to prevent radiation from the short piece of wire taken from the old loading coil and other hardware.

With a tube cutter, I then trimmed the ground planes to 13⅛", and replaced their plastic ends. Next the tubes were squeezed between two steel rods in a vise and flattened near the mounting area. Bending them to 45 degrees was comparatively easy, and structurally they remained very strong.

The assembled antenna seemed very small in comparison to the one I started with, since most of the original was left on my workbench! I mounted it on several lengths of TV tubing and it seemed to work very well. When finally installed over the house at 40 feet above the ground, it covered all the local area as well as quieting a repeater 65 miles away. A friend generously loaned me an SWR/Power Meter, and to my surprise the SWR was 1.1:1 at mid-range in the frequency.

The construction project was a lot of fun and cost me nothing, so I call it the *serendipity* antenna.

Looks and Price Can Deceive

There is an unhappy ending to the story. Some time later I bought a very fine and impressive commercial antenna with a claimed 5.5 dB gain and mounted it in exactly the same position as the tiny ground plane. It would not cover all the local area and would not even trigger the repeater 65 miles away. Sadly I took it down and replaced it with my home-built, and explained to the XYL that I had blown a lot of money. Is there anyone out there who needs a commercial 1¼ meter antenna? 73

John M.C. Wilson KA1LCC is a recently retired aeronautical engineer. He became interested in two-way radio when a tank crew member in the Canadian army. John has been an amateur since 1983. His address is now RR 2, Box 368, Peterborough NH 03458.

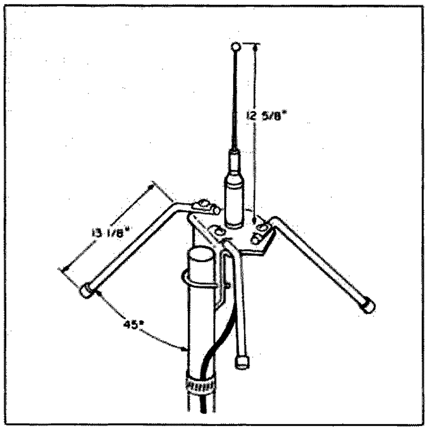


Figure 2.... and as a good-gain 1.25m antenna!

73 Review *by Bill Mick K3RVN/G0EZZ*

Yaesu FT-4700RH

Versatile 2m/70cm mobile transceiver.

Yaesu USA
17210 Edwards Rd.
Cerritos CA 90701
(213) 404–2700
Price Class: $800–$825

Most of us have seen the kind of mobile ham radio installation that's safe to operate only when the vehicle is parked. You can use a radio that's mounted under the passenger's side of the dash, or in the glove box, or down near the floor, but it's hardly user-friendly. Keeping your head down for long periods of time while driving can be downright unhealthy!

We can blame the automakers for this. If they had more engineers and fewer stylists designing their dashboards, your car would come with a standardized equipment bay in the center of the dash. After all, automotive radio and stereo units already fit standard cutouts. Imagine the convenience of simply racking and stacking your ham rig, cellphone, FAX machine, navigation and countermeasures gear, ashtray, coffeemaker, or flowerpot, just the way you want them, under a sliding wood veneer cover. Perhaps the Japanese electronics companies will influence the Japanese car companies. In the meantime I, and a lot of other hams, want to operate mobile, and we want to operate safely and conveniently.

An Elegant Solution

Over the years, various radio manufacturers have brought out models with remote controls or detachable front panels. These radios don't go far enough to meet my desires: I wanted full, flexible 2m and 70cm coverage in a package that doesn't require two hands to operate and doesn't crowd the front seat. Besides, as a Yank who has spent a lot of time working in England, I have mobile rig requirements that are a bit more complicated than the average ham's. The ICOM IC-900 was pretty tempting until I worked out the actual cost and discovered that I would have to buy a 440 MHz unit for stateside use, and a separate 430 MHz unit for U.K. use.

Enter the Yaesu FT-4700RH. It covers the full 430–450 MHz range at 40 watts, in addition to 50 watts on 2m, and the front panel can be detached and mounted where I can reach it while driving. The radio has all the expected features: ten memories on each band, flexible scanning modes, and low power (5 watt) capability. Dual-band receive is standard, with a balance control that sets the relative audio levels from the two sources. Crossband duplex operation is also possible, and a single button toggles between two separate transmit

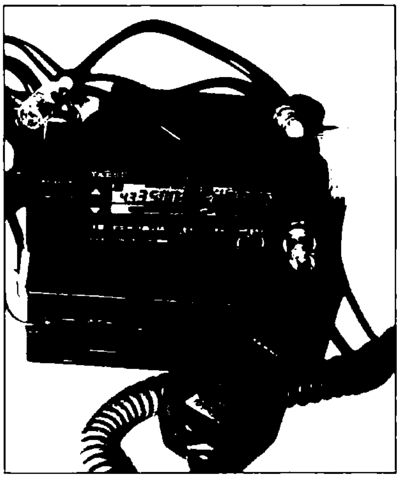


Photo A. Control head and main unit ready for installation. Note dummy front panel with remote connector.

sections. An arrow on the orange LCD display clearly indicates the selected band.

The FT-4700RH has a high contrast display with big numbers and a two-level backlight. The dimmed display is easy to read during the day, unless it's in direct sunlight. It has a separate S-meter/output bar graph for each band, as well as offset, tone squelch, and "busy" indicators. Surrounding the display window are fifteen controls, mostly push-buttons.

If you've used an FT-23R or MK II FT-290R, you'll find the basic functions of the FT-4700RH fairly obvious. Some of the fancier features had me slavishly following the detailed key sequences on the supplied reference charts. Fortunately, after an evening setting up my preferred memories, offsets, and scan ranges, I can now activate most of the complex personalized programming very easily. I still keep a few photocopies of the reference sheets in the car for inevitable future reprogramming.

Impressive Engineering

The FT-4700RH is really two rigs in one box. The nominal 13.6 VDC feed is common to both bands, and the received audio from both radios goes through a single speaker circuit. There are two flying coaxial leads, with an N socket for 70cm, and an M (SO-239 or "UHF" type) socket for 2m. You can also get an optional duplexer that will let you use a single feedline and a dual-band antenna. The panel display is symmetric with the two bands. The BAND switch selects one as primary, and the other as secondary. When the primary band is 70cm, key presses trigger a high tone; on 2m they trigger a low beep. You can set the step size independently for each band (5, 10, 12.5, 20, or 25 kHz). Half of the memories, including the "call" channel, are fully programmable, with parameters like separate receive and transmit frequencies (for odd splits), and optional CTCSS tones. Other memories store simplex channel data, or repeater offsets, and four hold subband scan range boundaries. Unlike many older radios, this model lets you choose a frequency via a memory selection, tap a button, and tune from that memory as though already in dial mode.

My unit came with one tone squelch board. You'll need a second board for CTCSS on the second band. The LOW power switch is common to both transmitters, meaning that you can't run low power on one band and high power on the other. The main unit has a heat sink with an integral fan, and the manual makes a point about ensuring ample air flow for the fan, particularly when running full power. Five-minute 50 watt transmissions cause only slight heating, even under the car seat.

The connection between the front panel and the main box is a 10-foot shielded cable with a miniature six-pin data plug. This cable is fine for hiding the main box under the seat, but is on the short side for trunk mounting. If you wanted to build an extension, the hardest part would be finding connectors to match. Two of the conductors are grounded, one feeds regulated 9 volts to the front panel, and one carries

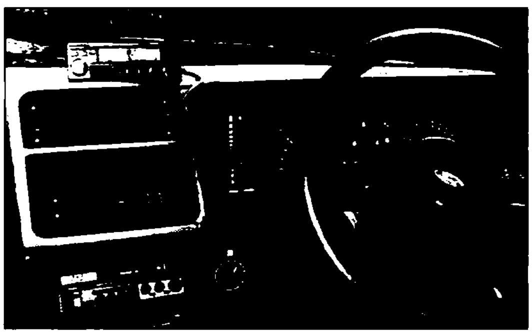


Photo B. FT4700RH installation in British Sierra XR4x4. The control head can go almost anywhere, and a strip of Velcro™ lets you detach it quickly for security. The right angle mike connector is home-brewed.

amplified microphone audio. The fifth conductor brings speaker audio to the microphone connector for packet or speaker-mike use. This leaves one conductor for all the control functions, including PTT!

Smart Front Panel

The FT-4700RH is a very intelligent radio, and much of this resides in two large SMDs behind the front panel display. Multiplexing switch settings or memorized frequency values onto a bi-directional serial line isn't all that uncommon in modern ham equipment. However, you won't find a lot of gear that translates analog control settings (volume, squelch, and balance) onto a serial line as the FT-4700RH does. Call me old-fashioned, but for me the Yaesu's knobs are more natural than sliders or "up/down" switches, even if level changes sometimes seem stepped rather than smooth.

Yaesu supplies a dummy front panel to cover the hole left by removing the smart one. This has been sold as an option in the past, but was supplied as standard with my unit. You often don't need to separate the front panel from the rest of the rig—even left in one piece the FT-4700RH is very compact. If the front panel is mounted separately, count on fitting an external speaker, too, as audio that emanates from under the seat will not be very satisfying. Surprisingly, I found no trace of RF feedback on either band, even at high power settings.

Ideas for Improvement

The FT-4700RH is just a bit shy of perfect for me. There are a few things I wish Yaesu had done differently. For instance, the POWER switch is sprung softly; a firmer switch would prevent accidental turnoff when pushing the nearby LOW or DIM switches.

The BAND switch is too far away from the tuning knob; it should be where the LOW and DIM switches are located to allow band switching and tuning without excessive hand movement. Likewise, the D/MR (dial/memory) and CALL buttons should be closer to the knob. In my opinion, the DIM and LOW switches just don't get used enough to rate such big buttons. I look forward to the day when an owner will be able to customize his control panel by assigning functions to the buttons he finds most comfortable.

With the variety of step sizes provided, I was surprised that there is no 15 kHz step option. The set deals well with the normal British 25 kHz channelization, but when the next guy up the band is operating between channels, only 12.5 kHz away, there is some breakthrough. With 15 kHz spacing, the signal on the adjacent channel has to be way off frequency, or wildly over-deviating, to cause a problem on receive. The supplied microphone on the U.S. spec model had a DTMF pad and the usual "up/down" step switches; a band change switch on the mike would be a very useful addition.

My major gripe is a matter of convenience, aesthetics, and human engineering. Although the control head seems like a natural place to connect the microphone, and traditionally things have been done this way, I find it inconvenient because the mike cable obscures the forward view when the head is visor-mounted. In contrast, the IC-900/901 control heads have no microphone connector.

A second microphone jack on the main FT-4700RH box, or on an inline box on the remote cable, would simplify the microphone connection in many installations. I expect that I will build some sort of inline box eventually, although the job will be complicated by the fact that the front panel actually contains a few stages of microphone amplification. Furthermore, since the PTT function is activated by a digital code on the serial I/O line, and not a simple closure to ground, it will probably be necessary to hook up a logic analyzer in order to scope out the PTT code. If Yaesu really wants to capitalize on its design, it will market an interface box that permits external computer control in lieu of the front panel.

My FT-4700RH currently rides in a British Ford Sierra XR4x4, a close relative of the Merkur XR4RTI sedan imported into the US. Current versions of this model have a dashboard inset which houses a digital clock, and this space just happens to accommodate the control head, with the help of a couple of rubber feet and a strip of Velcro™. The installation looks good, and can be concealed quickly when necessary. The controls are within inches of the steering wheel, and the display is at the same height as the speedometer and tach. Only an aerospace heads-up display would be closer to the forward line of sight. The hand mike would be convenient to grab, too, except that U.K. law prohibits the use of such mikes in vehicles.

I use a small boom mike, with a PTT switch on the gearshift, and a cable that runs up to the mike jack on the control head. This results in a very unsightly loop of microphone cable jutting out from the middle of the dash. I scoured suppliers on both sides of the pond to find a low-profile right-angle eight-pin mike plug, found none, and was forced to fashion my own, using parts from other plugs. It dresses neatly and disconnects instantly, since it has no threaded ring. This aids fast removals, helpful when I want to hide the controller before parking in a bad neighborhood. Unfortunately, the six-wire control cable is not a quick disconnect, something that the ICOM fiber optic mobiles do provide.

Conclusions

The FT-4700RH is a terrific radio! I can actually drive it and the car at the same time without scaring other motorists, let alone the people riding with me. The controls are easy to reach, there's no need to switch on the autopilot while checking the frequency, and my front-seat passengers don't have to share their knee room with a sharp-cornered box. The rig is inconspicuous, reliable, versatile, and loud. It'll be burglarproof, too, as soon as I can devise a quick disconnect for the front panel, and some form of dual-band stealth antenna.

Contact Bill Mick K3RVN/G0EZZ at P.O. Box 565 MHS, APO NY 09210-5361. Photos by Susann Mick N2HLK.

Painless PCBs

Sheds light on the black art of designing a PC board diagram from a schematic.

by Larry R. Antonuk WB9RRT

The topic of etching circuit boards has been thoroughly covered in recent amateur literature. Whether by use of resist pen, dry transfer, photocopier, Dremel tool, positive resist, negative resist, or whatever, each author considers his method to be God's gift to the electronic hobbyist. One thing all of these articles have in common, however, is the assumption that you have access to a perfectly designed, flat-black, camera-ready layout for the board. In other words, someone has already taken the time to develop the circuit schematic diagram into a workable PC board layout, and they were kind enough to include a copy of it with the article.

But what if the project you want to build doesn't come with a PCB layout? Or what if you want to modify an existing layout? What if you actually (shudder) designed the circuit yourself? Is there an easy way to get from the schematic stage to the PCB stage?

The answer to this question, like so many others, is "Yes! Sort of..." The best way to learn to develop a printed circuit design is to DO IT. Then do another one. The more you do, the easier they'll get.

There are a few guidelines most hobbyists use, however, whether they're aware of them or not. If followed, these guidelines will make the process clearer, more enjoyable, and more likely to produce a high-quality PCB.

Decide on the Project

This may seem a little backwards, but for the first couple of attempts at PCB design, it's best to chose a project that's not too complicated. Just because you've always wanted a 1 to 1000 MHz/triple conversion/multi-mode receiver doesn't mean that now's the time to start. Instead, pick a small audio or logic circuit—mike preamp, logic probe, battery charger. Something with one or two ICs that you can finish in a reasonable amount of time. Likewise, stay away from RF circuits, especially those that use stripline components. Save the tricky stuff for later.

Breadboard the Circuit

A breadboard is a circuit board, usually made of phenolic or similar material, that has a grid of holes. Components are mounted in the holes and wired together temporarily, usually with hookup wire.

Of all the things that you can do to ensure a successful board, this is the most important. First and foremost, breadboarding lets you check for errors in the circuit diagram. Even if you got the schematic from someone who swears it's correct, you might be interpreting something differently than he did. If it's a magazine article, it will be at least a month before any error corrections are published. There's nothing worse than discovering that you made an absolutely correct printed circuit board from an absolutely wrong schematic.

> *". . . the photocopier method is the all-around best. . ."*

Second, breadboarding the circuit lets you test your components. No use soldering a bad IC into your new board.

Third, you can check out the use of the circuit in its actual application. Is this mike preamp all it's cracked up to be? If you use it for a week on a breadboard, you might decide to scuttle the whole project. Or even make an improvement or two.

Finally, the very act of plugging those parts in on the breadboard will give you a feel for how the completed circuit will look.

Decide on the Process

Obviously, you need to decide on the type of resist method you are going to use. While all of the above-mentioned processes have their strong points, the photocopier method is the all-around best for the casual experimenter. TEC-200 film is without a doubt the best invention to hit the market since the IC socket. Using a photocopier, you can make iron-on resist patterns with this product. (See *Tech Tips* in the April 1989 issue and "PCBs from TEC-200 Film," by K3OF, in the August 1987 issue.)

Even if you use TEC-200, you'll have to come up with a design to photocopy. The dry-transfer process works well, but only if you're positive that you need only one board. Of course, if you're only building a 7805 regulator circuit with a total parts count of four, you'll be done just as quickly if you put the dry-transfers right on the board and skip the photocopy step.

For anything even a bit more complex, it's best to go with the TEC-200 process. Photo resist methods are ideal, as long as your brother-in-law at the print shop lets you use the copy camera for free. Until then, or until you start designing 92-chip, four-layer boards, the photocopier process is just fine.

For discussion, let's assume we're designing a two-chip circuit using TEC-200 film.

Developing the Layout

The overall objective of this stage is simply to get from the schematic and/or breadboard to a complete full size mockup of the board, using dry-transfer (rub on) circuit components.

The first step is to sketch the board. Any type of paper is usable, but tracing vellum is best. You can put the paper with different size grids on it behind the vellum, and they will show through. Work in pencil, starting with the ICs. It's usually easier to produce a "component side" view, so visualize the board as if you were looking at it from above.

Plan on having ground running around the outside of the board, and run the V+ and V− paths. Next work with the signal paths. Don't worry about the relative sizes of resistors and capacitors, just sketch them in place. If you can't make all of the connections without crossing paths, simply sketch in jumpers. Treat them as real components so you don't forget them.

At this point you should have a very ugly representation of your future circuit board. If the board is fairly complex, it may be worth resketching a time or two, to make it cleaner. If it's a simple board you can move to the next step.

Laying Down The Pads

Run down to Radio Shack and get a new package of dry transfers. Take your vellum pad and put the 0.1" grid in place. Grab a cup of coffee. Now, before you do anything else, go through the process of your chosen resist technique in your head. Do it again. Make sure that you know whether you need a positive, a negative, a mirror image, or what. I have seen projects with components soldered

Continued on page 24

73 Review *by Steven K. Roberts N4RVE*

The Portal System

Now you can easily explore ham radio's most fascinating on-line forum!

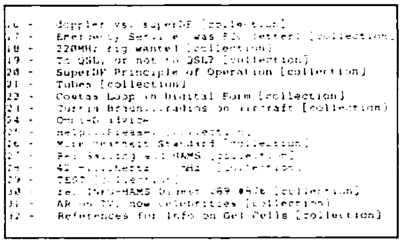
Amateur radio thrives on information. There is so much going on technically, socially, and politically with this complex hobby that those who don't make some effort to keep up are soon in a bit of a fog. ("Just exactly what IS packet?" a ham asked me at a trade show last week, leaning close so his friend wouldn't hear the embarrassing question.) Magazines help tremendously, for they are an edited, packaged collection of articles and graphics coupled with ads from the vendors who keep our technology alive. But what if you want quick answers to your questions, feel the urge to argue about no-code, need the latest Keplerian elements from AMSAT or DX forecasts from the MUF diviners, or just want to hang around and socialize with others? To some extent, we have our own networking technology for those, but neither real-time on-the-air nets nor the packet system have evolved to the point where they are dependable sources of geographically diverse information.

Enter Dataspace

Online, there are two major categories of ham radio information resources. First, there are forums such as CompuServe's HAMNET and GEnie's RT (radio roundtable), offering moderated bulletin-board and conferencing systems. They carry ongoing discussions as well as a growing library of downloadable software, captured online conferences, reference material, reviews, and so on.

The other class of ham-related online conferencing is rec.ham-radio, part of the Usenet (a complex linkage of some 20,000 academic, corporate, and private computer systems around the world). Unmoderated, freewheeling, and not even pretending to offer archives, rec.ham-radio is one of the most dynamic ongoing discussion forums within the ham community.

It's a bit hard to explain the network culture—asking you to imagine 20 years' evolution of packet doesn't quite give you the picture. Dataspace is a complex, multilayered not-land peopled by ghosts, strangers, wizards, and the alter egos of those you know. It's a place with intricate behavioral protocols, obscure symbology intended to increase bandwidth or soften harsh words, and harsh "flaming" of those who overstep the bounds of decency (or understep those of intelligence). This is the information home for millions worldwide, and some of them are hams. Active hams.



Screen capture of the rec.ham-radio menu.

Inevitably, this makes it a lively playground. As you can see from the screen capture shown in the figure, the topics range from the public perception of ham radio to technical details of specific rigs. Other topics found among the 86 active discussions present on 9/13/89 included: "KA9Q's TCP/IP software available!", "SOLAR ACTIVITY NR 35", "Interference on 2454 MHz", "Double ducky update", "Poor PRO-34 squelch circuit", "Anyone need Macau (XX9)?", and "Transmitting music for ATV."

The Portal System

There are many sites that carry Usenet newsfeeds, most of them in closed academic and corporate UNIX environments. But there's a way to gel there from your own PC via TELENET: the Portal System. Portal is a very user-friendly, brisk online service that provides E-mail, conferencing, and a number of other services. . .with terminal emulator support to make the online session brisk. It has a friendly "local" community, but I'm attracted to it primarily for the public-access Usenet and internet (E-mail) gateway. Best of all, it only costs a flat rate of $10/month plus any communication charges (TELENET or direct dial to Cupertino, CA).

To sign on to Portal, use your modem to call (408) 725-0561, or make a voice call to (408) 973-9111 for more information and an estimate of local charges. To get on the GEnie network, use your modem to call (800) 638-8369, hit HHH when connected, then respond to the U#= prompt with XJM11878,GENIE. On both systems, my electronic mail address is WORDY. See you in Dataspace! ■

Painless PCBs *Continued from page 22*

onto the foil side of the board—don't skip this step!

For our TEC-200 process we need to work from the foil side layout, so we need to reverse the component side we just made. If you used tracing vellum, just flip it over and trace over the paths. If you used regular paper, hold the sheet on a window and use the window as a light table.

Once you have the polished foil side sketch in front of you, you can go to work. Using the 0.1" grid, place the rub-on IC outlines in place near the middle of the board, making sure there's ample room between them. Again, if you start in the middle and work out, you can always make the board larger. Not so in reverse.

> ***". . . start in the middle and work out. . ."***

Rub down the power and ground paths, then start on the components. Now the size is critical. The resistors, etc., can be measured, and the measurements transferred to the layout. You may use a pair of dividers or a compass to transfer the dimensions. Or you can rub down one pad and hold the part above it, eyeballing the location of the second pad, whatever works best for you. Continue this process until the whole board is in place.

A Few Pointers

A straight line is indeed the shortest distance between two pads, but it's not the prettiest. All of your components, and all of the copper paths, should be running either vertically or horizontally. That's what the vellum pad grid is for.

Make use of large "ground plane" areas running around the perimeter of the board and coming right into the active circuit area. Mark the areas off with rub-on paths, and fill them in with ink. Likewise, use large areas for the V+ points. This practice helps reduce feedback and noise, makes your acid go farther, and gives you some space to correct things if you forget an A+ or A− wire.

Pay close attention to the points where wires leave and enter the board. For some reason, it's very easy to omit pads here.

Use large enough paths for the job—power runs are wider than signal runs. Don't run paths too close together—this causes crosstalk and high voltage arcing. Pads should be the correct size for their components.

Finishing Touches

Once the layout is finished, think about future expansion. Add a few pads to the power and signal points in case you ever want to tap off for another circuit. Decide where the holes should be for mounting the board, and put pads there to act as center punch points. Get some rub-on letters, and mark the power connections, switch connections, even the ICs. Make it pretty. Remember, each time it gets easier and easier! ■

Continuity Beeper

The ultimate in continuity checking convenience.

by Dick Fergus W9DTW

This circuit is a beeping continuity tester with a couple of twists. First, the testing power has been reduced to eliminate possible component damage. The low power also allows you to test circuits with the ICs in place, and it won't be fooled by forward conducting junctions. The open circuit test voltage is less than 50 mV, while the test current is less than 1 mA.

Second, the circuit is battery powered with an automatic power-down feature. It has no on/off switch. It powers up when you touch one of the test probes to the appropriate point. Each continuity test resets the turn-off delay, and the power will stay on for two to three minutes after the last test. Battery life for continuous operations should be about 50 hours. With the automatic power-down, the battery should be good for shelf life.

Audible Continuity Testers

The obvious advantage to such a tester is the instantaneous indication of continuity (beep) when the probes make contact. You don't need to hold the probes on the contacts while you turn to look at an ohmmeter. Using the latter, I have been frustrated when the probes would slip off the contact as I turned to look at the meter.

Another advantage of the audible continuity tester is that you can check for unwanted circuit paths. I usually drag the test probe along the socket or component pins as I look for the intended point. If a short or unwanted connection exists, I will hear a beep indicating continuity.

This method is also useful for tracing circuit paths. Just put one probe on a connection, then drag the other probe around the board until you hear a beep. This can be a real help on two-sided boards or boards with hidden traces.

Circuit Overview

See Figure 1. A dual comparator IC (U2, LM393) detects the continuity and generates an audible tone. Comparators generate output voltages which compare two inputs. If the minus (inverting) input is negative with reference to the plus (noninverting) input, then the output will be positive. If the difference polarity is reversed, the output voltage is reversed. Most comparators are very sensitive, and it only takes a few millivolts difference to produce a maximum output voltage swing.

Note that it's the voltage difference between the two inputs, and not the voltage from ground (common mode) that's important. There is a limit on the common mode range, but that's not important right now.

Circuit Details

Again referring to Figure 1, the inverting input of U2A (pin 2) is biased to about 45 millivolts by R5 and R7. This voltage is greater than the noninverting input (25 millivolts). Since the noninverting input is less positive (negative) than the inverting input, the output must be at the minimum voltage or ground.

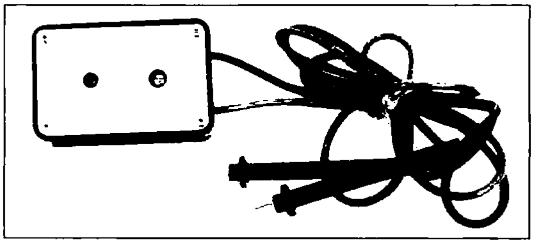


Photo A. W9DTW's audible continuity checker

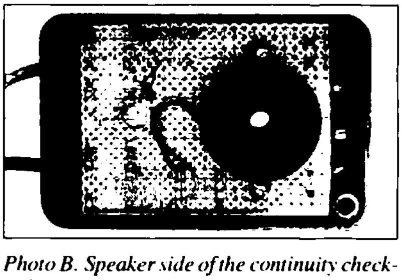


Photo B. Speaker side of the continuity checker board.

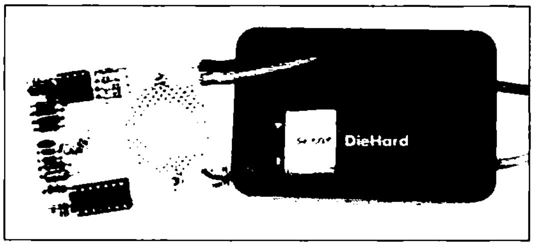


Photo C. Component side of the continuity checker board.

Actually, the output of this comparator is an isolated transistor collector and, in this case, the transistor is conducting. This output transistor will remain conducting until the inverting input is reduced to less than 25 millivolts. A path of less than 50Ω (circuit continuity) through the test leads will reduce this voltage and the output transistor will cease conducting.

The tone generator (U2B) produces a square wave at pin 7 when pin 6 is not shorted to ground by the U2A transistor. (The bottom test probe line is ground.) In this condition, C3 is alternately charged and discharged by the output signal through R12. The output signal also changes the voltage on U2B (pin 5). When the output is high, pin 5 is about 6 volts and C3 will charge until this voltage is reached.

When the C3 voltage exceeds the pin 5 voltage, the comparator switches to a high voltage and the cycle repeats. The output square wave drives the piezo transducer (speaker) and a "keep alive" circuit (C1, D1, and D2).

Auto Off

Battery power is controlled by a CMOS (complimentary FET) array (U1 CD4007). When C2 is discharged (by momentarily touching a test lead to ON), the P1-13 will drive the N2 gate to 9V. N2 then drives P3 on, and supplies power through pin 12, the main circuit.

If the beeper isn't used for a while, C2 will slowly charge. At some voltage, the P1 will start to reduce conduction and allow P2 to conduct. As P2 conducts, the current through R2 increases the charging of C2, thereby causing positive feedback and a very rapid power turn-off.

In the power-off condition, all FETs are nonconducting, so battery current will be only a few microamps. Each time you make a continuity test, the "keep alive" circuit discharges C2 with the rectified current through C1 from the output signal.

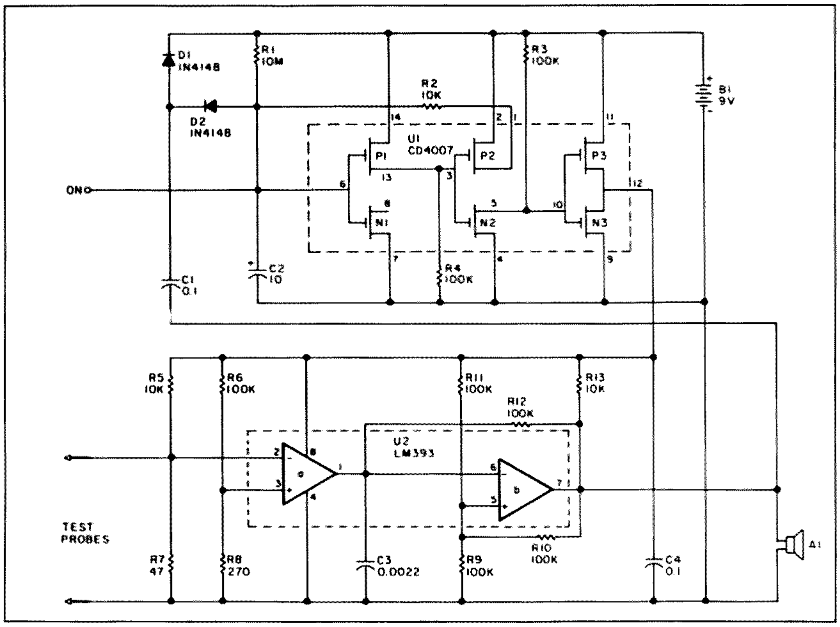


Figure 1. Continuity beeper schematic.

Construction

Layout or type of construction is not critical. Most of the U1 circuitry is very low current, therefore good insulation is necessary, especially around R1 and C2. The case is necessary only for physical protection. Since you don't have to mount anything to the case, you can assemble the circuitry in one piece with the test and battery leads connected. With slots for the test leads and clearance holes for the ON contact and transducer, you can stuff the circuitry into the case. The transducer does not make a lot of noise, so you may have to experiment to get satisfactory volume.

Easy to Use

To turn power on, touch either test lead to the ON.

To test continuity, touch test leads to circuit; if continuous, you will hear a beep.

Power will remain on for several minutes after the last test.

Note: Circuit resistance less than 50Ω will indicate continuity. In digital applications, you run into this condition very seldom.

This beeper has proven very useful. With complex computer circuitry, I've found that a few minutes spent "beeping" the circuit can save a lot of headaches. It's much easier to find a wiring error by beeping than by debugging with the scope.

For those who are forgetful, the auto power-off saves battery life. It isn't the cost of battery replacement that's the problem. It's that batteries are usually dead at the most inopportune time. That must be somebody's law—probably a Murphy corollary. ■

Dick Fergus W9DTW has been a ham since 1947, and is especially interested in computer applications to ham radio. Dick is currently an electronic engineer for a mid-western firm. Other interests include building and flying private planes, and working on the detection of severe weather by electronic means. You can reach Dick at 2N570 Argyle St., Lombard IL 60148.

Parts List

Part	Description	Jameco	Radio Shack		Cost
A1	Piezo Transducer		273-073		$.99
B1	9V Battery		23-464		.59
C1,4	0.1 µF 50V	DC.1/50		@ .15	.30
C2	10 µF 35V Tan.	TM10/35			.59
C3	0.0022 µF 100V	MY.0022/100			.10
D1,2	1N4148	1N4148		@ .07	.14
R1	10m 5% 1.4W	R10m			.05
R2,5,13	10k 5% ¼W	R10k		@ .05	.15
R3,4,6,9,10,11,12,13	100k 5% ¼W	R1k		@ .05	.40
R7	47 5% ¼W	R47			.05
R8	270 5% ¼W	R270			.05
U1	CD4007	CD4007			.25
U2	LM393	LM393N			.39
2 Sockets 14-pin		14LP		@ .12	.24
Battery Connector			270-325		.20
Case			270-231		1.69
Test Leads			278-712		1.69
				Total Cost	$7.87

73 Review *by Steven K. Roberts N4RVE*

The Spectrum Probe

Inexpensive and portable spectrum analyzer.

Smith Design
1324 Harris Road
Dresher PA 19025
To Order: (215) 643–6340
Price Class: $200
(Call for possible qualification for special introductory offer.)

There's nothing quite like the frequency domain for revealing what's going on in a system. Down in the slow-moving mechanical world, Fast Fourier Transform (FFT) analyzers are used to determine the resonance characteristics of structures and to help predict failures. In RF systems, high-performance spectrum analyzers instantly spot harmonics and spurious noise. All of this is impossible with trusty time-domain instruments like oscilloscopes.

A spectrum analyzer is simple in concept. Just imagine sweeping the center frequency of a filter upwards from a low value, displaying the amplitude of the signal that passes through it on a scope that sweeps at the same rate. if you repeat this quickly in synchrony with the scope trace, you have a spectrum plot, with horizontal displacement indicating frequency and vertical indicating amplitude. Put an antenna on it, and you have a snapshot of the electromagnetic spectrum.

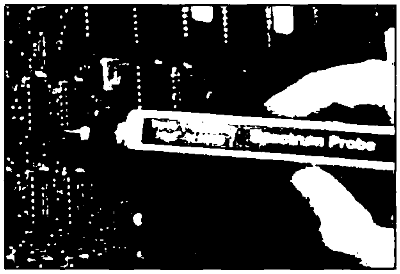
The problem is that most spectrum analyzers are expensive—$10-$40,000 from the major instrument vendors. Isn't there a way to hang something on the front of a cheap oscilloscope to produce the same effect?

A Spectrum Plot—Cheap

Indeed there is. A new product from Smith Design looks like a fat scope probe, but actually works as a 1-100 MHz spectrum analyzer. It lacks the features that make the expensive ones a delight to use. There are no cursors to give you digital indication of a peak's frequency, nor are there controls of any kind other than those on the scope. Determining frequency with accuracy involves a bit of guesswork and interpolation (delayed sweep helps)—but still, it's a spectrum plot. This can be incredibly useful if you're trying to track down digital noise, spot strange and unwelcome harmonics, detect impulse energy like arcing or intermittents, or otherwise peer into a signal environment that looks like clutter on a time-domain scope.

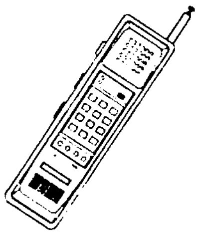
Using the unit is simple. A wall transformer (supplied) plugs into one spur of a split cable, and the other plugs into the BNC vertical input of your scope. Set the vertical attenuation to 50 mV/div, the sweep to 0.5 ms/div, and sync negative. The resulting display is logarithmic in amplitude, with a range of about 50 dB. If you touch your finger to the tip, you see a display of AM, low-band VHF, TV channels 2–6, and about half the FM broadcast band. Transmit on HF nearby, and the display goes crazy. The probe presents a very small load to the circuit under test—only 10pF, comparable to a standard scope probe.

This tool isn't of the highest quality, but it's very useful. The evaluation unit was dead on arrival, but the problem turned out to be trivial—an intermittent short in the connection to the female 3.5mm power socket. The Spectrum Probe's connectors, product packaging, and general construction techniques appear cheap, and the documentation is not well written—but in all fairness, this is not pretending to be a Hewlett-Packard. It's very well worth its modest price!



The Smith Design spectrum analyzer probe.

The Spectrum Probe is a clever and useful tool if you have a fairly casual but recurring need to see what's happening in the 1—100 MHz frequency domain. I'll probably carry it on my next bicycle trip (along with the Createc handheld scope) to help sniff out logic-generated noise problems and other leakage. There's certainly enough of that to keep the device busy.



73 Review

by Jim Bail KA1TGA

PC QSO Tutor

Learning is easier when you're having fun.

QSO Software
208 Partridge Way
Kennet Square PA 19348
Tel. (215) 347-2109
Price Class: $30

So you've decided to get your ticket or to upgrade? Do you own or have access to an IBM or clone? If you answer yes to both questions, then make the learning fun—boot up PC QSO Tutor.

QSO Tutor works on any IBM or clone with 256K of memory or more. The screens look good on either a color or monochrome monitor.

What is QSO Tutor?

It is an MS-DOS program that includes all of the questions in the question pool for the license class for which you are studying. In its simplest form, it serves as a computerized deck of flash cards, but to leave it at that would not do it justice.

QSO Tutor takes advantage of the computer's ability to sort the questions in a variety of useful ways. The questions are organized into categories that match the chapters in the equivalent ARRL study guide, such as Signals and Emissions, Electrical Principles, etc. When you start a session, you can choose to be tested in only selected categories, all categories, or "auto-weighted," in which the Tutor drills you on the categories it sees you are weak in. You can also select a sample test like the one you will take with the Volunteer Examiner (my favorite of all the options). The program keeps a running score displayed on the screen, and, with the stroke of a key, it displays a breakdown of your score by category.

How to Use It

The Tutor is menu-driven, so you don't need to be a whiz to get around. Pop it in, boot it up, and start your session. The program then sorts its questions and displays a randomly selected question just as it would appear on the FCC exam. It tells you immediately whether your answer is right or wrong, and tells you the correct response. On some of the questions you have the option of getting an explanation of the answer after you have made your choice.

QSO Tutor is NOT a replacement for the license manual. It does, however, serve as a tremendous complement. I found that by paying close attention to the questions I missed, I was drawn to the manual for a stronger understanding.

One great example of this is the previously mentioned sample test option. Each night after work I take at least three separate tests (each takes about 15 minutes) and record my score in each category. In short order my weakest areas become apparent. I simply focus my studies on those areas, then drill myself on all of the category pools.

Thumbs Up

QSO Tutor's random generation of questions is more than acceptable. Besides a few misspelled words, the question pool is free from distracting errors. It would be nice, however, if the program would record test scores automatically. QSO Software plans to add this function in future versions, but for now you have to manually track your progress.

QSO Tutor is available for all of the classes, each with a second disk that includes schematics for the questions that deal with them. All of the license class programs operate in the same pattern.

Do I recommend the QSO Tutor? Heartily, yes! It really motivated me, and it's a great way to test my progress. The learning is a natural by-product of the fun I am having!

73 Review

by C.L. Houghton WB6IGP

ICOM 12GAT HT

Get on a band where there's still elbow room.

ICOM America, Inc.
2380-116th Ave. N.E.
Bellevue WA 98004
(206) 454–7619
Price Class: $530

1.2 GHz in a hand-held? There are still parts of the country where VHF and UHF repeater allocations are uncongested, but not out here in Southern California! Also, there are advantages to hand-held operation on this band over the lower frequencies—read on to find out about them!

Initial Impressions

I was struck by the simple and convenient control layout. If you're familiar with ICOM products, you'll likely be able to operate the 12GAT right out of the box. On the top panel are full frequency-setting rocker switches, especially handy since I like to use my HT on my belt or in a top coat pocket. The display panel and volume and squelch controls are also conveniently mounted on top. To change frequency on the other HTs, I had to dismount the HT to look at the front panel.

The unit is about 1 inch shorter than an IC-04 equipped with an 8.4 volt battery pack. All of my questions were answered by the well written instruction booklet that came with the radio.

Operating the 12GAT

The transceiver has two power levels: 1 Watt, and 0.1 Watt. Operating with a 13 volt battery package won't increase the power output because the internal power module won't output more than one Watt. On the two units I was given for test evaluation, both measured rated power output to within 0.2 dB across the entire 1200 MHz band from 1243 MHz to 1300 MHz. The radio's specifications guarantee operation from 1260 MHz to 1300 MHz, but it will actually operate down to 1243 MHz before the synthesizer unlocks.

Field Tests

N6IZW and I made several tests comparing the 23 cm operation with 2 meters for path loss performance. Both N6IZW and I used IC-02ATs for the 2 meter comparisons.

Because microwaves often suffer greater path attenuation—especially with organic material (e.g. trees) in the path—than lower frequency energy, we weren't surprised at its reduced range. When the path on two meters was noisy, contact on 1200 MHz was impossible. Additionally, when we tried a path three miles distant, below tree level (semi-line-of-sight), contact was not readable on 1200 MHz using the rubber duck antenna. (Antennas were limited to the rubber duck for all tests.) Also, rapid movement gave a very noticeable multipath flutter to the received signal.

Since microwaves are smaller than two meter waves, would they more easily pass through small apertures? We found this to be the case. When using a repeater situated about six miles from both of our locations, it did not matter if we were inside a car or in our respective shacks: The results were excellent quality. We were able to make contact through a variety of structures I previously thought impossible to penetrate. Reverting to 2 meters for comparison proved the 12GAT better in radiating out of the inside of cars and other confined spaces, giving a good accounting of itself over short paths.

IMD?—What IMD?

We used the WA6ZST 1200 MHz repeater for the tests. To my surprise, I was able to access this same repeater from my work location in downtown San Diego, normally a shielded location. Signal reports using the repeater were very good despite being shielded by the building and by a 200 foot hilltop in the path to the repeater.

Operating this HT in a very large computer center gave me a pleasant surprise. With many different disk drives and other data processors, all generating RFI, this had been difficult for my 2 meter HT, taking it to intermod city. There was no such interface problem with the IC-12GAT.

To properly get into the repeater from inside the building, I had to hold the antenna very steady once I located the "sweet zone" providing a good path to the repeater. I found this spot through trial keying up and checking my return. This "sweet spot" or antenna orientation was a very small defined position, and I found many of them within a 2 foot radius. There were many very small peaks and nulls as I made a vertical movement to find the best spot. A slight movement would make my signal unreadable. Holding still provided very good quality on a QSO for 20 minutes.

Special Features

The 12GAT has 20 memory channels and a priority call channel. All 38 subaudible tones (CTCSS tones) can be programmed with ease, without a chart, because the display reads the tone frequency instead of a tone number. This is a nice feature not found even on the IC-0xAT series radios. Additionally, you can equip the HT with an optional UT-40 tone squelch unit to allow it to function as a tone-activated pager. Again, you can se-

The ICOM 12GAT 1200 MHz Transceiver: Technical Specifications

Frequency Coverage	1240 To 1300 MHz
	1260 to 1300 MHz guaranteed
Receive Sensitivity	0.25 mV for 12 dB SINAD
Squelch Threshold	Less than 0.18 mV
Spurious Rejection	Greater than 50 dB (1st IF)
Power Supply	8.4 volts standard
	5.5 volts to 16 volts acceptable
Current Drain 13.2 V	Receive/audio output 250 mA
	Receiver power saver on 24 mA
	Transmit high power 900 mA
	Transmitter low power 400 mA
Spurious Emissions	Less than −40 dB
Receiver System	Double conversion 72.2 MHz first IF, 455 kHz second IF

lect the tone you wish to respond to. This capability, combined with the battery saver option that reduces power consumption to 24 mA, greatly extends its operating time on a single charge.

ICOM uses a TNC coaxial connector for the antenna on this radio. This appears to be a thread-on version of the BNC connector, but is rated for use up to 12,000 MHz (12 GHz) with little loss. A very important factor at these frequencies!

You can operate the IC-12GAT using all of the IC-02's accessories. ICOM has put the connector for the remote microphone on the side of the radio in order to make room for all the controls on the top of the radio.

A Winner!

I was very impressed with the quality of construction and the smooth operation of the 12GAT. I enjoyed many long QSOs on local 1200 MHz repeaters. I did not feel that I was tying up repeater use and should therefore terminate contact. Operation in this part of the frequency spectrum allows longer contacts and removes you from the crowded band conditions found on 2 meters and 70 cm. The 23 cm band is 60 MHz wide, giving plenty of room for repeater operation. I recommend the 12GAT for anyone who is interested in 1200 MHz HT operation.

Color SSTV for the Atari ST—Part II

Cheapskate's way into the fascinating world of color SSTV.

by John W. Langner WB2OSZ

In Part I, we went into a little bit of the history and the basics of slow-scan television, and described how to build a low cost SSTV interface for the Atari ST. In Part II, I show you how to build a high performance interface for a still-modest amount of money.

Upgrading

Figure 8 shows the station configuration for the high performance interface. The program also supports this interface, which connects to the MIDI port (see the block diagram in Figure 9). MIDI stands for Musical Instrument Digital Interface, a standard for connecting computers and electronic musical instruments. The MIDI port is simply a serial interface similar to an RS-232 modem port. However, MIDI is permanently configured for 8 bits per character, no parity, one-stop bit, and 31250 baud. It also uses a current loop rather than a bipolar voltage. A MIDI port is available as an option for most home computers. It is standard equipment on the Atari ST.

The demodulator converts the received audio to a video signal of 0 volts (black) to 5 volts (white), and a positive TTL-compatible sync signal. I took this part from an earlier design in "Color Computer SSTV," by K6AEP and WB8DQT, Parts I and II, in the November and December 1984 issues of *73*. These articles are also in the ESF reprint booklet 103 (for the address, see reference 4 at the end of this article).

I was not pleased with the performance and made some modifications. First, the low-pass filter had a cut-off frequency of about 250 Hz, so details were lost. I tinkered with component values to get a fairly flat response out to about 900 Hz (see W9NTP and WB8DQT's *Slow-Scan Television Handbook*, Chapter 1 published by *73* in 1975) and a sharp cut-off above that. Second, the AC coupling in the sync circuit did not accurately preserve the length of vertical sync pulses, so I made it DC-coupled. The modified schematic is in Figure 10. Other SSTV demodulators with compatible outputs would also be suitable.[6] Figures 11 and 12 contain the rest of the high performance interface. The computer sends bytes to the interface through J1 at the desired pixel sampling rate. Each time the UART (U2) receives a byte, it commands the A/D converter (U3) to begin a conversion. A video signal of 0 to 5 volts is converted to an eight-bit number in the range of 0 to 255. The UART converts this to serial form and sends the sample value to the computer through J2.

Photo C. Atari ST SSTV images.

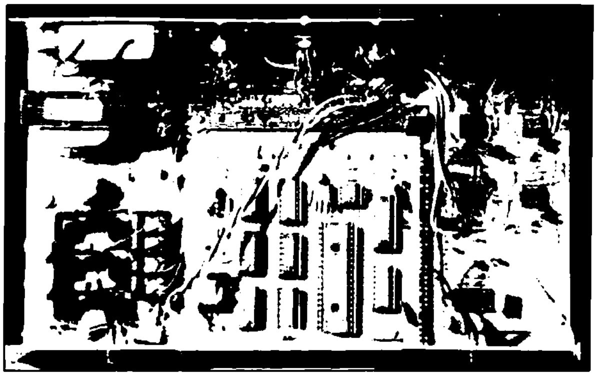


Photo D. High-performance interface layout.

Note the jumper connected to the least significant bit (pin 26) of U2. In the current version, this bit is used for the sync signal from the demodulator. I plan in a future version to try using the full 8 bits to represent a tone in the range of 1000 to 2400 Hz, and perform sync detection in software. This would allow automatic compensation for slightly mistuned signals, and decoding of the format information in the vertical sync of the Robot formats.

See Figure 12. The tone generator produces a crystal controlled, phase coherent sine wave and requires no adjustment. U4 and U5 are a programmable divide-by-*n* counter. U6, U7, and R10–R12 produce an approximation of a sine wave. The output frequency is 250,000/(256-*n*), where *n* is the data from the computer. When the two most significant bits are ones, the tone generator is turned off. When in transmit mode, the relay (K1) turns on the transmitter and substitutes the tone generator for the microphone.

Adjustment

The demodulator must be adjusted to produce the proper mapping of frequency to voltage. Many construction articles simply instruct you to whip out your audio signal generator, digital frequency counter, digital voltmeter, etc., and fiddle with the pots until it's right. Many hams don't have all this fancy test equipment, however, so I wrote a program called HPITEST. During adjustment, the output from the tone generator is connected to the demodulator input. The computer sweeps the tone generator output across the range of about 1000 to 2400 Hz and plots the output on the screen.

Signal Analyzer

Some people can tune in RTTY and packet signals very accurately by ear, but most, myself included, can't do this. Tuning doesn't seem to be as critical for SSTV, but a visual tuning aid still helps. The optional signal analyzer/tuning indicator (see Figure 13) has a 20-segment LED display, each segment corresponding to a frequency range of about 70 or 80 Hz.

The HPITEST program has another option for calibrating this display. While the computer is rapidly cycling the tone generator between 1200, 1500, and 2300 Hz, the pots are user-adjusted to position the dots in the desired locations. A properly tuned signal appears as a big blur in the 1500 to 2300 Hz range (depending on the particular pic-

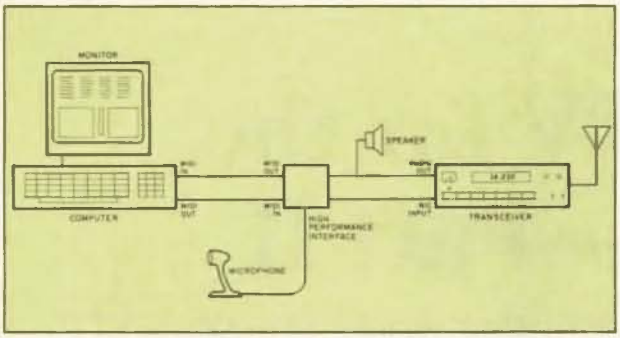


Figure 8. Station layout using the high-performance interface.

ture), and as a separate sync dot at 1200 Hz.

Obtaining Software

A free demo version of the software, with slightly reduced functionality, is available from *Atari Microcomputer Network, John Adams KC5FW, 17106 Happy Hollow, San Antonio TX 78232* (send formatted disk and $2), and from *ASTUR (Atari ST Users on Radio), GEERAERT Michel, W. Elsschotlann 21, B-8460 Koksijde, BELGIUM* (send two disks and three IRCs. One disk will be returned to you).

This version can send and receive (both color and black & white), load pictures from files, print, manipulate images, and generate test patterns.

But, its few limitations and annoyances are enough to encourage frequent users to upgrade to the most recent full version. The full version is included with the kit from A&A Engineering (see Table 4).

Conclusion

This approach is not a state of the art system, but it's a great way to try a new mode of communication with very little investment. The total cost for the low-cost system, featured in Part I, is only about $10 for the interface (depending on what's in the junkbox) and demo version of the software. See the address for A&A below for the kit cost for the high performance version.

For more information on SSTV and ham radio applications for Atari computers, tune in to the nets and subscribe to the publications in the sidebar listed in Part I.

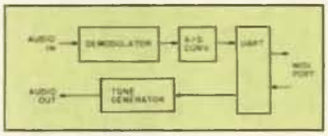


Figure 9. Block diagram of high performance interface.

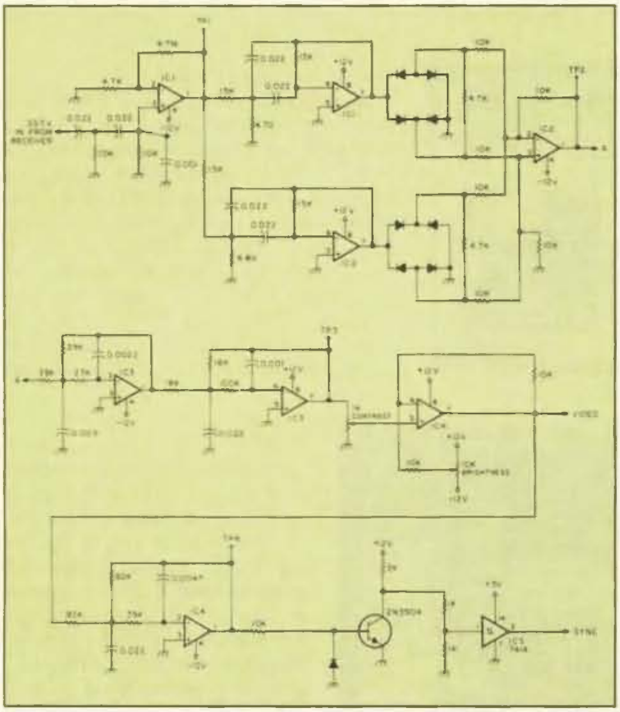


Figure 10. Modifications to the schematic in the "Color Computer SSTV," article by K6AEP and WB8DQT, Parts I and II, in the November and December 1984 issues of 73. This is the demodulator for the high-performance interface.

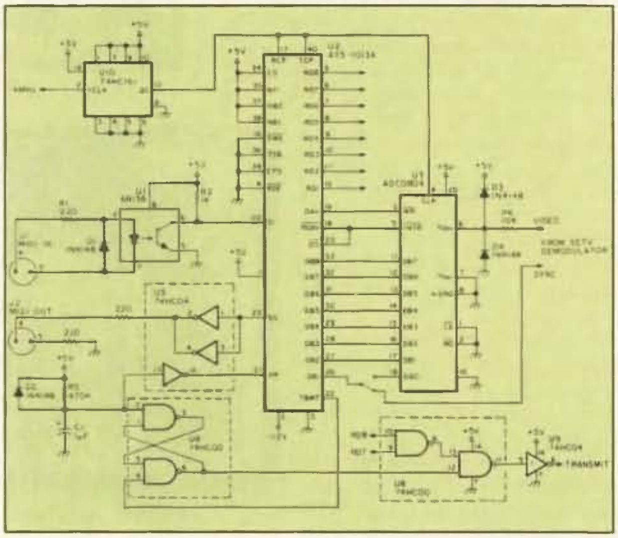


Figure 11. Schematic for the UART and A/D portion of the high performance interface.

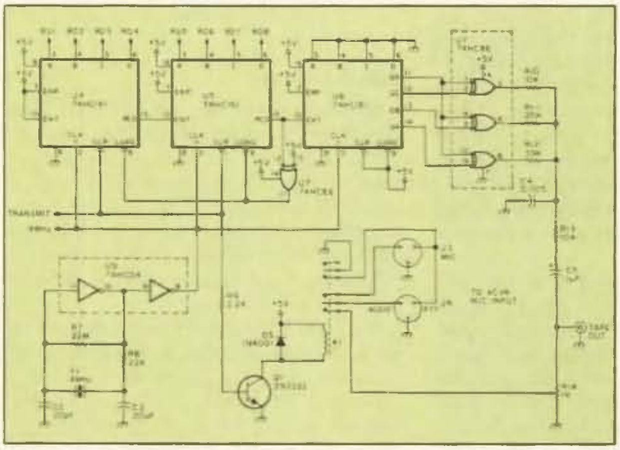


Figure 12. Schematic containing tone generation for the high performance interface.

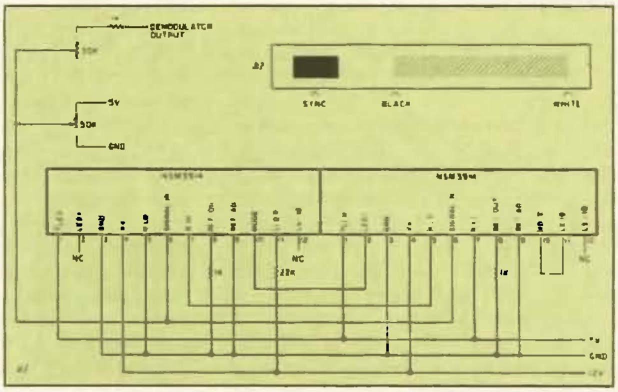


Figure 13. Visual signal tuning aid. a) shows the schematic, and b) is a diagram of the LED display.

References

[4]Suding, Robert W0LMD, "8 and 12 second single-frame color SSTV." *The Best of A5—Slow Scan Television*, page 34. (Reprint booklet number 103 from ESF Copy Services, 4011 Clearview Drive, Cedar Falls IA 50613. $10 plus $1 postage.) Suding formats are not commonly used now.

[6]Schick, Martin K. KA4IWG, "Color SSTV and the Atari Computer." *QST*, August 1985.

Table 4.
Parts List for High Performance Interface
(excluding demodulator and power supply)

C1,C5	1 µF electrolytic
C2,C3	20 pF mica
C4	0.005 µF mylar
C6-C9	0.1 µF disc (5 V to ground)
D1-D4	1N4148
D5	1N4001
J1,J2	5-pin DIN female socket
J3,J4	mike connector of your choice
K1	5V DPDT relay
Q1	2N2222
R1,R3,R4	220Ω
R2	1 k
R5	470 k
R6,R10,R13	10 k
R7	22 M
R8	22 k
R9	2.2 k
R11	20 k
R12	39 k
R14	5 k pot
U1	6N138 optoisolator
U2	AY-5-1013A UART or COM 8017P (pin compatible but does not require −12V)
U3	ADC0804 A/D converter
U4–U6,U10	74HC161 4 bit counter
U7	74HC86 quad exclusive OR
U8	74HC00 quad NAND gate
U9	74HC04 hex inverter
Y1	4 MHz crystal
Misc. Items:	cabinet
	power cord
	power switch
	IC sockets
	prototype board
	5-pin DIN cables (RS 42-2151)

A pair of kits, for the SSTV circuit and a visual voltmeter, are available from A & A Engineering, 2521 W. La Palma, Unit K, Anaheim CA 92801; PH: (714) 952-2114. The visual voltmeter is used for the tuning indicator:

Both circuit boards only	
#168/169-PCB	$24.95
Both kits w/ circuit boards and program	
#168/169-KIT	$124.95
Boards tested and assembled and program	
#168/169-ASY	$149.95
Program only	
#168-PGM	$25.00

Complete kits include PC boards, all components, DIN connectors, and software. They do not include cabinets, microphone connectors, or cables. The kit requires only a +12V supply, so most people can use their transceiver power supplies.

Dx

Hams Around the World

Bob Winn W5KNE
c/o QRZ DX
PO Box 832205
Richardson TX 75083

New DX Column!

Greetings from your new DX editor. Writing about the DX scene is not new to me, as I have been editing a weekly DX bulletin, *QRZ DX*, since 1983. I've been an active DXer since 1976. I've worked 291 countries, all CQ zones, and I've participated in several DXpeditions and contest operations.

My DX operations include VK9YW and XEØKNE in 1987. I was one of the operators at CY9DXX in 1988 and CYØDXX in 1989. My other hobby is photography, and I enjoy showing my DXpedition slides at DX gatherings around the country. I'm looking forward to editing this column, and I'm open to suggestions about the content. What would you like to see?

Bouvet Island DXpedition

After almost a decade of silence, Bouvet Island had climbed to the top of the most-wanted list for the majority of DXers. The first operation, by Gus Browning W4BPD as LH4C in 1962, did little to whet the voracious appetite of DXers around the world. Subsequent operations by LA5DQ and LA1VC, who signed 3Y5DQ and 3Y1VC, respectively, during the 1970s, did not completely satisfy the need either.

The announcements of DXpeditions to Bouvet Island by Club Bouvet and the Legion of Indianapolis DXers late last year were welcome indeed. Club Bouvet, represented by Einar LA1EE, Kaare LA2GV, and Erling LA6VM, was scheduled to activate the island during this past Christmas/New Year season, but since this column is being written in October, the outcome of their operation is not known.

Coming Soon

In late September, the Legion of Indianapolis DXers announced their own Bouvet Island DXpedition, scheduled to begin operation on February 2, 1990. This announcement culminated almost 2 years of development, planning, and negotiations. The Saturday Evening Post Society and the *Saturday Evening Post Magazine* of Indianapolis is partially sponsoring and organizing the effort. The total cost of the expedition, expected to be around $120,000, is funded by private corporate interests and landing team members. Participants in this combination scientific/amateur radio expedition include the National Geographic Society and numerous universities.

Suggested Frequencies Transmit/Receive

Band	SSB	CW	RTTY
160	none	1825/1835+	none
80/75	3695/3800+	3505/3525+	none
40	7055/7200+	7005/7025+	none
30	none	10105/10125+	none
20	14145/14200+	14005/14025+	14088/14090+
17	none	18070/18080+	none
15	21195/21300+	21005/21025+	21088/21090+
12	none	24905/24925+	none
10	28295/28450+	28005/28025+	28088/28090+

The amateur radio group plans to land 12 radio operators and operate seven stations during a 10–12 day stay on the island. The list of operators includes Tom N9AZD, Rusty W6OAT, Bill KA9AND, Mike W9SU (expedition director), Jay WB9LTY, Mike NE9O, Chip K7JA, Mike WA9NPM, Al WB9QPN, Jim WB9CEP, Brian KA9OIH, Mike W9RE, and Martti OH2BH.

All operations from the island will be conducted with the call-sign 3YØB.

During amateur radio maritime mobile operations, the call-sign 3YØB/MM Region 1 will be used. QSLs will be handled by WA9VGY.

See the table for suggested frequencies in transmit/receive format.

An Adventure to Visit

The 1,387 nautical mile voyage to the island will be aboard the *Deep Salvage I* of Capetown, Republic of South Africa. *Deep Salvage I*, a maintenance and salvage vessel, is 184 feet long and 31 feet wide.

The five-and-a-half day voyage to the island is scheduled to begin on January 25, with arrival on January 31. The next day, the landing team will leave in small inflatable craft to go ashore.

Bouvet Island is one of the most isolated and inhospitable islands in the world. High cliffs surround most of its coastline, and an extensive glacier covers the plateau at its highest point. Gus W4BPD, in the October 1967 issue of *73 Magazine*, described the island as resembling "...a very large chocolate cake with white frosting on its top side."

Number 17 on your Feedback card

ASK KABOOM

The Tech Answer Man

Michael Geier KB1UM
7 Simpson Court
S. Burlington VT 05403

Z Matching, O'scopes, and Other Matters

A few words before delving into this month's topic. Folks have been writing in, and I'd like to ask a favor regarding correspondence: Please DON'T send a self-addressed stamped envelope in expectation of a reply. Although I occasionally do try to help via return mail, it's usually not possible. I'll do my best to get topical letters into the column.

This month's column focuses on troubleshooting modern solid state gear. Along with that goes some background on basic electronics and test equipment. I can't be of much help with tube rigs and amplifiers, tuners, feedlines, etc. Also, I'm not the one to contact regarding antenna matters, as I'm no expert on skyhooks and (gasp!) don't even like the things. Please refer antenna questions to *73*.

Matchmaker, Matchmaker

Howard WB0IWN wrote asking that I discuss impedance matching and efficient power transfer. Why does a matched impedance result in the greatest efficiency?

Lots of arcane math will prove the point, but it's easier to explain using common sense and a basic understanding of Ohm's law. When we talk of power transfer, we mean it in the literal sense: transfer of watts, not volts or amps alone. Power (watts) is the product of current (amps) and voltage. If you have, say, ten watts of power, it could be 5 volts at 2 amps, 20 volts at ½ amp, or 1 volt at 10 amps. Any way you slice it, it's still 10 watts.

Since power is amps times volts, the maximum power will be transferred when the maximum current flowing through the load coincides with the maximum voltage across it. If you've ever played with a battery or a power supply, you know that there is a limit to what it can deliver. After all, it is a finite source of energy, so it's got to give up at some point. When you try to pull too much current from it by connecting it to a load with a very low resistance, its voltage begins to drop, even while it's giving all the current it can. The battery's own internal resistance (everything has some) forces the voltage down, because it is significant compared to the very low load resistance. Try drawing a circuit with a battery, a resistor in series with it, and then another in series with that. The first resistor is the battery's internal resistance, and the second is the load. If the first is one ohm and the second is 100 ohms, you can see that there won't be much voltage drop across the one ohm resistor. If, however, the load is ½ ohm, then the one ohm resistor will cut the voltage going to the load down quite a bit.

So, if the source resistance is greater than the load resistance, the voltage across the load will drop, even though the current will be at maximum. But what about the other way around? If the load resistance is higher than the source, the voltage will be fine but not all the current available from the source will be flowing into the load. Either condition results in less than optimum transfer of watts from the source to the load. When the resistances are matched, however, the voltage drops across the source and load resistances will be equal. The maximum current that can flow, without dropping more voltage at the source than at the load, will be flowing. In other words, the most watts will be transferred. AC impedance, of course, is a more complicated phenomenon, but the basic idea is the same: to maximize the voltage across, and current flowing through, the load. That's why a 50 ohm transmitter output delivers the most power to a 50 ohm antenna, and a 600 ohm mike works poorly into a 50,000 ohm mike input.

Whew! Compared to that, the next topic will be easy.

> *"Power (watts) is the product of current (amps) and voltage."*

I Can See!

In previous columns, I've mentioned that the oscilloscope is a very powerful troubleshooting tool. Undoubtedly, you've seen other references to scopes, too. But with all those knobs and dials, they must be very hard to use, right? And they must cost a fortune, too. They're for laboratory scientists, not for you, right?

Hah! Don't believe it. The truth is, scopes are easy to use, and you can probably find a decent one for little money at the next hamfest. But what the heck does a scope really do?

A scope is a fast electronic graphing machine. It displays a simple graph of voltage over a period of time. The spot on the screen sweeps from left to right, over and over again, and moves up and down in relation to a changing voltage coming from the circuit being tested. It's just like the X and Y coordinates of a paper graph, only faster.

Your scope lets you eavesdrop on any point in a circuit. Working without one is like painting blindfolded—it can be done, but it's hard. Detailed interpretation of the scope's display is an acquired skill, but getting familiar with the basics of scope operation shouldn't take more than an evening or two.

The controls on most scopes are grouped according to their functions. Near the screen, you will find adjustments for brightness and focus. Near the input jacks (where you connect the signals to be displayed) are controls which size the vertical motions to make them fit the screen. Another group of controls sets the time it takes for the beam to sweep across the screen. Along with these are adjustments for the trigger, which makes the beam begin sweeping at a consistent point along the input waveform, to provide a stable display.

You can use your scope for measurement as well as simple display. The sweep speed and vertical amplitude controls are calibrated with respect to the little boxes (called the "graticule") painted on the screen. If your vertical input is set for 2 volts per division, and the beam deflects 3 divisions when you connect your input signal, then you have measured 6 volts! It's that simple. If a square wave signal requires 4 boxes for an entire cycle (from left to right), and your sweep speed is set to 3 milliseconds per division, then the wave has a period of 12 milliseconds. To get the frequency, just divide 1 by the period. In this case, the answer is about 83 cycles per second. It's important to note that, in general, scopes do not offer the precision and accuracy associated with frequency counters and digital multimeters. The scopes typically have error specs ranging from ±3% on up to ±10%. But they allow measurement within complex waveforms, something no other instrument can offer.

Picking One

Scopes come in many varieties and price levels. Although some laboratory instruments (especially those with digital storage capabilities) can cost thousands of dollars, there are plenty of low-cost units from which to choose. The first step, as with any equipment purchase, is to evaluate your needs.

The most important price determinant is bandwidth. How fast will the signals you want to display or measure be? The bandwidth is specified in megahertz (MHz). A low-cost unit may have only a 5 MHz bandwidth, which can be quite limiting in radio work. With such a unit, you wouldn't, for example, be able to see the 10.7 MHz IF signal in an FM receiver. Nor would you be able to see the output of a 10 meter rig. A better choice would be a 25 or 40 MHz bandwidth, which would cover most frequencies of interest. Such scopes can be had new for around $500.

Many mid-priced scopes have dual trace capability. This function lets you view two signals at once so that you can examine the relationships between them. It's very handy for working on circuits which involve feedback loops because you can see causes and results at the same time. For much general troubleshooting work, though, you can do without it.

Nearly all modern scopes have

triggered sweep. That is, they withhold the sweep until triggered by the incoming signal. It's a very important function; avoid the older "recurrent" type scopes which require manual sweep synchronization.

Advanced scopes offer a delayed sweep function. This lets you pick any point on the incoming waveform and expand it to fill the screen, even if it is not the point from which the sweep was triggered. It's very useful for video and digital work, but has little use for most radio applications, where the signal is very repetitive.

Very advanced scopes have digital functions like waveform storage and numerical measurement. With such units, you can "grab" a signal, examine it, perform precise measurements of voltage and time on any part of it, and even, in some cases, save it on a computer disk! Such instruments are generally out of our price range, and most of the time we don't need them anyway.

Making the Buy

There are lots of mid-priced scopes advertised in the ham and general electronics magazines. They are all solid state (except, of course, for the cathode ray tube). If you can afford a new one, buy it. That way you'll be guaranteed years of trouble-free operation. After all, if your scope quits, you won't have a scope with which to fix it!

You can find good scopes at hamfests, but be careful. Avoid old tube units. Most of them are more than 20 years old, and they are likely to have problems. Look instead for a smaller solid state scope. If at all possible, find an electrical outlet and plug it in. The trace should be well focused, and the sweep should be straight and clean when the vertical input control is turned to its least sensitive position. Try turning the sweep speed down in the millisecond range and touching the input connector with a screwdriver or piece of wire. You should see an AC waveform that looks somewhat like a sinewave, although it may have various wiggles in it. At least you'll know that the vertical amplifiers are working.

If you do wind up having to fix your scope, be especially careful, as very high voltages are used to drive the CRT. Approach a scope as you would a television set.

Expect to pay $50–$300 for a good used scope, depending on its capabilities. It's helpful to know the approximate value of a new, similar model, so read the ads before you go. You don't want to pay $300 for a 20 MHz unit when you could get a brand new one for $350.

Now, let's look at some letters.

Dear Kaboom,

I just installed an ICOM IC-228H 2 meter rig in my car. The manual says "never use or store at a temperature below +14 degrees F." I live in Vermont, so I'm worried. Will this rig survive the winter?

Signed,
Brrrr

Dear Brrrr,

Manufacturers go to great lengths to present their products in the best possible light. So, when they inform you of a limitation, you'd best believe it! Low-temperature limitations are usually the result of characteristics of some of the materials used in the radio. The problem could be as simple as brittle plastic, or as serious as ruined crystals or LCDs. I'd take that rig in during brutal weather, or get another radio more suited to your climate.

Dear Kaboom,

My Yaesu FT-757GX was recently repaired, after experiencing a problem with sideband selection. Now I get a terrible SWR on 10 meters in my car, even though other rigs connected to the same antenna show a 1:1 match! The '757 works fine in the shack, and I can cure the mobile problem by adding lots of coax to the antenna system. But it used to work. What gives?

Signed,
Mystery Box

Dear Mystery,

This is an obscure one, all right. I'd guess that something in the rig's output filter for 10 meters is broken, and the unlucky combination of its incorrect reactance and the length of your mobile coax is doing you in. If it used to work and now doesn't, it's gotta be broken. Send it back to Yaesu and tell them it started when you got it back.

Have a tech question? Send it off to "Dear Kaboom" at the above address.

Number 18 on your Feedback card

QRP

Low Power Operation

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Thirty Meter QRP Transmitter

Thirty meters is a grand band for working QRP. In fact, I was on 30 meters the other night working quite a few stations with 3 watts from the Argosy. I also worked a station running 1 watt, crystal controlled. He had such a fine-sounding signal, I decided to give the 30 meter band a crack with a homebrew transmitter.

Tracking down a good, workable 30 meter transmitter turned out to be rather easy. I wanted something simple, easy to tune, and requiring no special parts. The result is shown in Figure 1. Only three active devices are used. As a matter of fact, you might have seen the basic schematic before. It is a well thought-out circuit. Not much can go wrong.

Let's take a closer look. The oscillator is crystal controlled. A variable capacitor and coil form a simple network to "warp" the crystal's frequency a bit. Depending on the crystal, you should be able to get about 2 to 4 kHz worth of frequency spread. I've had some rocks that really moved for me, and others that were, well, "rock solid."

The Oscillator

The oscillator transistor is a 2N2222 (what else!). Notice the 8 volt zener diode on the base of the transistor. This supplies a regulated voltage for the oscillator. The 60 pF trimmer across T1 tunes the circuit to resonance. This trimmer will provide a nice peak in output power. The PA transistor is quite common. You can get by with just about anything, provided you keep somewhat close to the specifications of the 2N3553. A 2N3866 will work as well, as will most PA transistors from defunct CBs.

The resistor across the 3-turn link of T1 swamps the input to the PA transistor. Depending on the final you decide to use, you may not have to use R1. Or you might just want to increase the value a little. If the final runs away, you can reduce the value of R1 to settle the final down.

Two output filters are shown. One is a simple, single stage circuit, and the other is a dual filter (see Figure 2). I used the dual filter for better harmonic attenuation. Remember that just because RF power is low, it doesn't give you the right to send out a dirty signal.

The crystal should be an AT cut, HC25U case style, 30 pF loading type. This will allow for maximum amount of VXO swing. You could, of course, use the older FT-243 style of crystal, but you won't get much, if any, VXO swing out of the crystal. I bought my 10.100 MHz crystal from *Crystek Crystals, PO Box 06135, Ft. Myers, Florida, 33906-6135; (800)-237-3061.*

The VXO can only raise, not lower, the frequency. The 10.1 MHz rock should give control up to 10.104 or so. A second crystal, a bit higher, would give almost 100 percent coverage of the most popular frequencies. I only had one rock, and therefore did not worry about frequency switching. You could use a rotary switch and select between different crystals, or as I will do later, use a relay and select between only two crystals. If you opt for a selector switch, just make the connections to the crystals as short as possible.

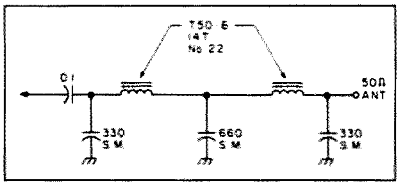

Figure 2. Alternative low-pass filter for greater attenuation of harmonics.

In Figure 1, see the three points marked X, Y, and Z (above and to the lower left of 2N4036). Depending on how you configure these three points, operation will be slightly different. By connecting points X and Z, the oscillator will be keyed along with the final. Connect points X and Y, and the oscillator will run all the time. Use these points if you have a chirpy crystal (i.e. a crystal that doesn't key on and off rapidly) or want to operate a direct conversion receiver from the oscillator. This little circuit should work up to 10 meters, at which point it would be best to leave the oscillator running all the time and just key the final. Otherwise, connect point Z to X for normal operation.

The DC switch transistor supplies 12 volts to the final and to the relay control. Next month we'll discuss the relay control. The transmitter will key by taking the KEY line (lower right of schematic) and pulling it to ground. The 0.1 µF caps add a bit of shaping to the CW envelope, to help avoid key clicks.

I built my version on copper-coated Radio Shack perfboard. You can change some values and still end up with a working unit. You can use a 9.1 volt zener diode in place of the 8 volt unit, and almost any NPN transistor for the oscillator. The DC switch should be capable of handling the current for the final, and the 2N4036 does a very good job. Don't use a leaky, out of spec junk box device for the 2N4036.

Tuning Up

This requires only a receiver, a crystal, and a wattmeter. Turn the receiver on, tuned to the crystal's frequency. After checking your work, apply power to the transmitter. With the output terminated into a dummy load, key the transmitter. Tune the trimmer capacitor in the oscillator for the best combo of maximum power and good sounding tone. Depending on the crystal, final transistor chosen, and the supply voltage, you should be able to get anywhere from 1 to almost 3 watts of RF out of the transmitter. Tune the VXO. Notice the frequency change as you move the VXO capacitor.

That's about all there is to it! You'll find thirty meters a great band for working QRP. I use my Yaesu FRG-7 receiver and the transmitter for 30 meters. While the FRG-7 is no gleaming bandit on 30, the setup works quite well.

To "spot" the transmitter so I could find the frequency on the FRG-7, I connected a momentary DPST switch between points X and Y. You want to wire the switch to remove power from the PA while supplying it to the oscillator. A diode, 1N4001, in place of the jumper between points X and Y, with a simple SPST switch, should work as well. At least, as long as you keep the VCC from the PA when you operate the spot switch. This will turn on the oscillator without turning on the final. Therefore, you can find the crystal's frequency without causing QRM on the band.

Next month I'll have QSK and sidetone circuits working on a 30 meter receiver converter.

With all these quartz-locked transmitters walking about, buying crystals may run into a bit of money if you order them through crystal dealers (as opposed to buying them at hamfests). Even then they are sometimes hard to find in the value you want.

Customizing Surplus Crystals

There are several options, though. You could always build a VFO, and if you do, be sure to send the schematic, PCB foil diagram, and parts placement diagram to me so the rest of us can benefit. Grinding a crystal, howev-

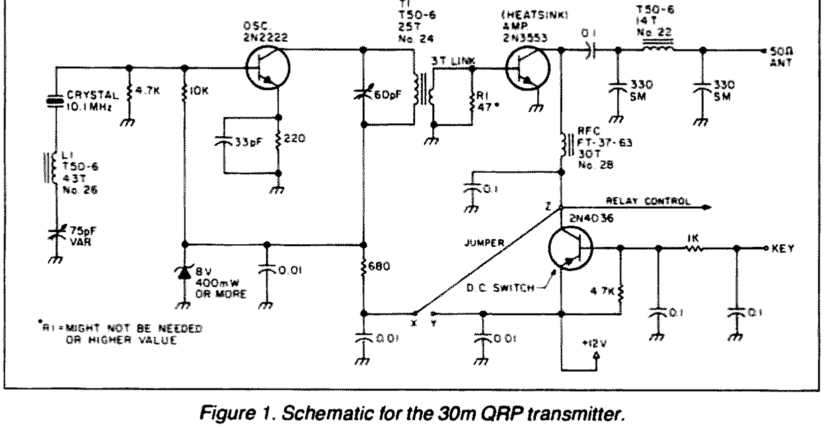

Figure 1. Schematic for the 30m QRP transmitter.

er, may be the fastest way to go. The war surplus crystals in the FT-243 cases can be found just about anywhere. Prices range from nickels and dimes to dollars. If you find an FT-243 rock close to the frequency but lower than what you wanted, you're in luck! Grinding crystals raises their frequency.

You can easily find what you need to custom-make those surplus crystals. You'll need an abrasive, such as Comet cleanser or baking soda; a frequency counter or general coverage receiver; some alcohol and Q-tips; a sheet of glass; and a test circuit to check the frequency of the crystal.

Check the frequency of the crystal first. Make sure you wash your hands to remove excess body oil. After you determine the frequency of the crystal, remove the three screws holding the case together, and open it up.

The crystal looks like a piece of frosted glass. Remove it very carefully. Next, take a piece of glass and lay it flat on the table. Pour about half a teaspoon of the abrasive onto the glass, and add some water to make a wet paste.

Place the crystal in the paste. Using a figure-eight grinding motion, make about five circles while pressing down slightly on the crystal.

Clean the crystal with some alcohol and pat it dry, being careful not to touch the face of the crystal with your fingers. Reassemble the crystal into the holder. Insert the crystal into your oscillator test circuit and measure the frequency. If too low, take it apart and repeat the grinding operation, then test it again. Using this method, you should be able to get within a few cycles of what you want.

If you overshoot and grind off too much, you can slow the crystal down by running a number 2 pencil across its face. Don't over do it! Too much lead and you'll ruin the crystal.

Grinding your own crystals can be a lot of fun. Now there's no reason for not building the 30 meter transmitter in this month's QRP column.

Hot Water Handbook

Still looking for mods for the third edition of the *Hot Water Handbook*, especially for the HW-9. If you're modifying the HW-9, send your creation to me. If I use it, I'll send you a free copy of the new book.

Winter will prove to be a great time for working the world on a few watts. ■

Number 19 on your Feedback card

HOMING IN

Radio Direction Finding

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Secrets of Success on Six

Last month I told you why 6 meters is an excellent band for T-hunts. Surplus equipment is inexpensive. You may already have a scanner that covers the band. I showed how to build a simple loop antenna, as used successfully by several hunters in the monthly hunts on 50.3 MHz FM sponsored by the Southern California Six Meter Club (SCSMC). This month I'll tell you about "secret weapons" that advanced 6-meter hunters use.

The SuperDF on Six

The Super DF by BMG Electronics, reviewed in *Homing In* last November, has the advantage of being a very wideband system. Connected to an extended range FM scanner, such as the Regency MX-7000, it can hunt over a wide frequency range without retuning. Antennas do not have to be resonant for proper RDF operation.

The SuperDF VHF antenna set, with 18-½" whips spaced 22-½" apart, is specified to work down to 50 MHz. It works fine on 2 meters, but it doesn't generate enough DF tone on 6 meters. I couldn't get good bearings with it, so I built another antenna unit especially for 6, with longer elements spaced 48" apart. It worked much better.

If you wish to build a 6 meter antenna set for your SuperDF, K6BMG cautions you to be sure to use a metal boom between the whips for good performance. The SuperDF performs best on vertically polarized FM signals. The receiver must be tuned exactly to the hider's frequency to prevent RDF errors due to receiver IF/discriminator response characteristics.

Quads on Six

Over the years, 6 meter hunters using quads have done better, on average, than loop and SuperDF hunters. John Wendt WA6BFH and Merrils Scheffer N6PON have won several 6 meter hunts using a full-size, 2-element quad in the back of a pickup truck. Merrils drives, and John sits in the truck bed to turn the quad (see Photo A). Rain makes hunting this way uncomfortable, though, so now they usually operate with the quad on a mast through the roof of a large van.

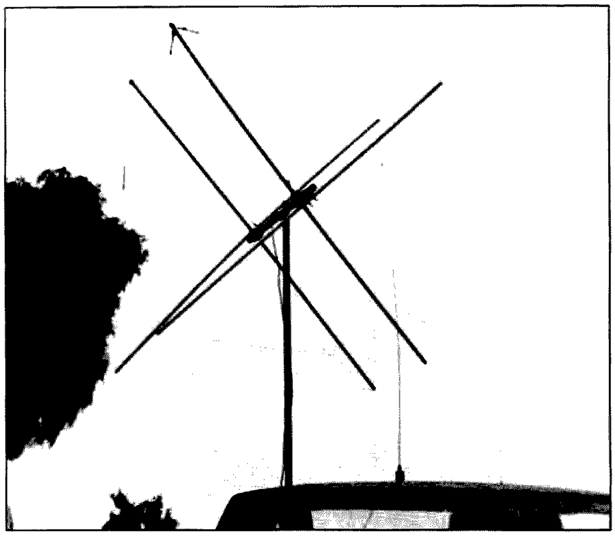

Photo A. You can get good 6 meter T-hunt performance and work some DX with a full-size quad, if you have a vehicle big enough.

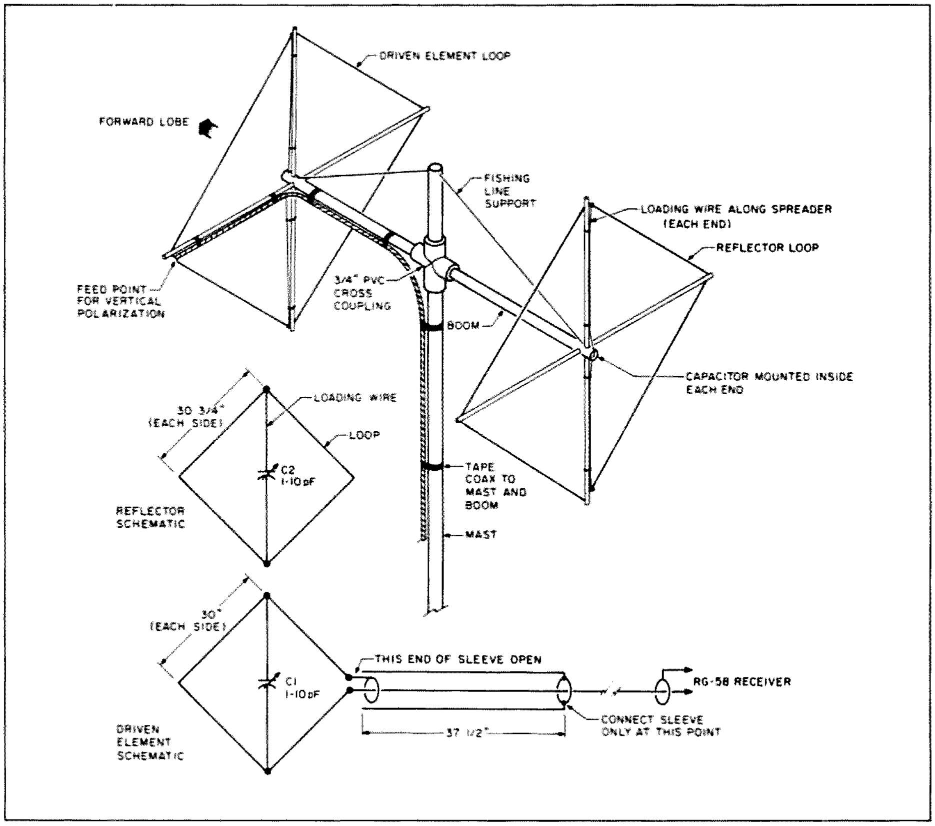

Figure 1. Construction details for the 6 meter shrunken quad. See text for additional dimensions.

Shrink Your Quad

A full-size quad on 6m? The elements are over 4-½' on a side. That's too big and heavy for me! Fortunately, it's possible to "shrink" a quad significantly while maintaining good directivity. WA6OPS and I have had our share of wins with the antenna shown in Photo B. It is an adaptation of a shrunken quad design for 2-meter on-foot hunts (see Moell and Curlee, *Transmitter Hunting: Radio Direction Finding Simplified*, TAB Books #2701, pp. 173-176. Available from Uncle Wayne's Bookshelf). Capacitive loading techniques result in a quad with element dimensions only about half as large as the WA6BFH quad.

Build the Shrunken Quad

Figure 1 shows construction details of the smaller quad. Schedule 40 PVC pipe (thick wall) is suitable for the mast and boom. I used ⅜" wooden dowel rod for the spreaders and AWG 18 enamel-covered solid wire for the elements on my experimental model. However, fiberglass rod spreaders and copperweld wire would make a much more rugged quad. The capacitors are miniature piston trimmers. Don't use air variables because dirt and moisture on them will upset the critical tuning of the elements.

Cut a 22-¼" PVC pipe for the driven element half of the boom, and a 26-¼" pipe for the reflector side. Drill holes at right angles for the spreaders, being sure to space the holes so that the spreaders are just touching inside the boom. The point of contact of

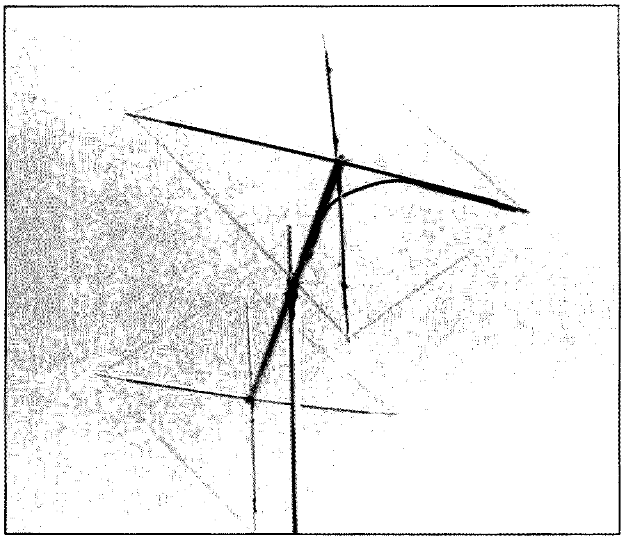

Photo B. This shrunken quad finds 6 meter transmitters just as well as a full-size quad, but it's only half as large.

spreaders is 1" from each end. This gives 48-¼" element spacing and proper balance when the two boom pieces are fitted into the ¾" PVC slip-type cross fitting.

Cut the spreaders 43" long for the driven element and 44" for the reflector. Drill small holes in the spreaders ¼" from each end for the element wire. When assembled, the driven element wire circumference is 120" and the reflector circumference is 123". Carefully distribute the wire between the spreaders so that the four quarter-wavelength spans of each element are equal in length.

When the loops are strung, add the loading wires and capacitors as shown. For ruggedness, drill small holes in the ends of the boom for the loading wires, and secure the trimmer capacitors inside the ends of the boom. Orient the capacitors so that they can be adjusted with a screwdriver from below. Complete the assembly by installing a 10" extension on top, with taut nylon fishing line supports to keep the boom from flopping up and down along the road.

Bolt the two boom pieces into the PVC cross fitting to allow disassembly for storage and transport. I secured everything else with hot melt glue to allow further experimentation and changes, but two-part epoxy would be more durable. Lace the loading wires securely to the spreaders and tape the RG-58 feedline to the mast and boom.

The balun minimizes distortion of the pattern by the feedline. The sleeve is a length of braid from an old piece of coax. Make a small cut in the coax jacket 37½" from the driven element end to expose the braid. Connect the added sleeve to the coax braid at this point and smooth it out over the jacket. Cut it off a quarter inch from the driven element end, making sure it does not contact the RG-58 feedline shield at that point. Put tape over the ends of the sleeve to keep it in place and prevent shorts.

Even at the reduced size, this antenna is too large to mount on a mast through a vehicle side window. You would be inviting a ticket for "excessive overhang." Instead, you will have to punch a hole for the mast through the roof, mount it in the bed of a pickup a la WA6BFH, or use your sun roof.

The antenna as shown is for vertical polarization. The diamond orientation prevents detuning caused by interaction with the vehicle's roof. For horizontal polarization, rotate each element 90 degrees. The feedline will then be at the bottom corner.

Give it a Tune Up

This antenna is not designed for transmitting. Do not tune it with a wattmeter or SWR indicator. Instead, connect it to a receiver with an S-meter and use a separate transmitter or signal generator as a signal source. Keep the source power low or use an RF attenuator in line with the receiver so that the S-meter stays in its linear range.

The transmitting antenna should be at least 50 feet away, using the same polarization as the shrunken quad. Mount the quad on your vehicle as it will be used for hunting. The vehicle and source should be in the clear, away from large objects, such as houses, trees, power lines, and other vehicles.

A loaded antenna such as this has a high Q. Its bandwidth for good directivity is quite narrow. Tune the antenna at the exact hunt frequency. If you change the hunt frequency more than 100 kHz, retune it. Wide spacing minimizes interaction between the elements, but can't eliminate it entirely.

To tune the antenna, first remove the reflector from the PVC cross and set it aside. Aim the antenna at the signal source and tune trimmer C1 for a peak on the S-meter. Hand capacitance will affect the adjustments, so overtune if necessary and always move your hand away to check results. Next, put the reflector back on the quad, point the antenna away from the source, and carefully tune C2 for a null on the S-meter. Turn the quad back toward the source and repeak C1, without removing the reflector this time. Repeat the sequence as necessary until no further improvement is seen.

A coax switch and a whip antenna should be included in your setup if you need to be able to transmit. A quarter wave whip on the side of the car does not affect performance of the shrunken quad. Don't forget to include an RF attenuator between the quad and receiver to knock down the signal as you close in and the S-meter pins.

Of course, this antenna does not have as much gain as a full-size 2-element quad, but it has more gain than a mobile whip and much better signal pickup than a small loop. On one recent hunt, all the loop users struggled to eke out enough signal to get an initial bearing, even with SSB receivers. All the while, both the KØOV shrunken quad and the WA6BFH full size quad were getting "armchair copy" and accurate bearings.

Six meter hunting with the shrunken quad is quite similar to hunting with a beam or quad on 2 meters. The main lobe is broader than the lobe on a full-size quad, but it's still sharp enough to get accurate bearings if you use a sensitive S-meter for strength indications. Occasionally you may drive into a location where the signal seems to be coming from all directions equally. Move a block or so away and try again. Happy hunting! ■

Number 20 on your Feedback card

PACKET TALK

Latest in Digital Hamming

Brian Lloyd WB6RQN
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Two Enlightening Packet Conferences

Last autumn I attended both the TCP/IP Interoperability Conference (INTEROP 89) and the annual ARRL Computer Networking Conference. What I have seen at these two event leads me to believe that 1990 is likely to be a watershed year for packet radio.

INTEROP is an academic conference and commercial trade show oriented towards "internetworking" different types of computer systems. INTEROP is significant to packet radio because the ideas and techniques displayed there will ultimately trickle down to amateur radio. The path works both ways—experimentation in amateur packet radio has had a significant effect on the Internet. (See the sidebar for a quick description of the Internet.)

At this year's INTEROP Phil Karn KA9Q, Brian Kantor WB6CYT, Mike Chepponis K3MC, and Kevin Rowett N6RCE attached the local area packet network in San Jose to the Internet using the KA9Q Net program and a couple of WA4DSY 56 Kilobaud modems. (See the October 1989 issue of *73* for a description of these modems.) This demonstrated to the Internet community the advances in amateur packet radio networking and allowed the local packet community to get a taste of what "real" computer networking is like. The results were so striking that they could very quickly spoil you.

The 8th Annual ARRL Computer Networking Conference

For amateur packet radio, this event is always important. New ideas and techniques are presented in the papers and most of the people who actively work on the development of packet radio technology are present to exchange ideas.

This year the conference was held on the grounds of the US Air Force Academy in Colorado Springs. It was very well attended (143 pre-registered attendees) with people coming from 23 states and seven other countries (Australia, Canada, Costa Rica, England, Germany, Netherlands, and Sweden). Authors wrote and presented 29 papers covering everything from applications to modems. The Rocky Mountain Packet Radio Association (RMPRA) did a first-rate job in organizing the conference.

New Commercial Products

The major packet manufacturers, (e.g. AEA, DRSI, Kantronics, and Pac-Comm) showed significant new products that will raise the performance of packet radio by at least an order of magnitude. Bdale Garbee N3EUA had the new PK-186 packet switch that AEA will be releasing (probably by the time you read this). The PK-186 is a high performance, four-port packet switch. Each port of the PK-186 is capable of over one megabit per second (1 Mbps) throughput. Just the thing for a high-speed, mountaintop packet switch!

DRSI was on hand showing their Awesome I/O (AIO) board designed by Mike Chepponis K3MC. The AIO board is a four- to ten-port packet radio board designed to fit into an IBM-PC or clone. The AIO board is in many ways similar to the PK-186. The first four ports are designed for high speed (>1 Mbps) operation. The optional six additional ports are designed for low speed (300, 1200, 9600 bps) operation. For people who do not have a PC, the AIO board can operate stand-alone. Just feed the board a diet of clean and regulated +5 VDC and it is happy to do your bidding sans PC. (It also needs a source of ±12 VDC if you want to use an RS-232 connection.)

Kantronics displayed two truly revolutionary devices: a radio designed for packet operation and a high-speed TNC. The radio, the DVR2-2, is a two channel crystal-controlled rig that operates on 2m and produces 2W of RF output. It was designed from the ground up for packet radio. In addition to its very high speed T/R switching, the DVR2-2 has direct access to the discriminator and the modulator for optimum signal quality. It can be used without modification with the 9600 bps modems that are now available. The DVR2-2 is housed in the same package as the KAM. The suggested retail price is $199.95, but I am sure that it will be discounted by the mail order dealers.

The new Kantronics TNC is called the DE-56 "Data Engine." This is a three port (two radio/modem ports and one computer/terminal port), high speed TNC. The radio ports are guaranteed to operate at 56 Kbps and probably faster (my guess is that they should work at speeds in excess of 250 Kbps).

At the heart of the DE-56 is a NEC V-40 microprocessor. This means that the DE-56 is essentially an IBM-PC in a KAM-sized box (no, it is not a PC but it can potentially run the much more powerful packet software that, up to now, only ran on a PC or similar computer). With its ability to accept and use up to 512 Kb of RAM/ROM, the DE-56 is truly the next-generation TNC.

Pac-Comm demonstrated a new, very tiny TNC-2 work-alike. Pac-Comm's new TNC is about the same size and price as the Heathkit tiny TNC but it offers some significant advantages over the Heath product. First, the Pac-Comm TNC comes stock with a 550 mAh battery pack that will let it operate for many more hours than the Heathkit TNC using its optional battery. Second, the Pac-Comm TNC will support the KISS protocol necessary to use the TNC with the more advanced packet programs. If you are into portable packet this will be a welcome product.

New Amateur-Built Radios

Radios seemed to dominate the convention. It seems that packeteers have gotten the message—that the radio is just as important as the TNC. Bdale Garbee N3EUA was there with the 10 GHz transceivers that he and Glen Elmore N6GN designed and built. Fresh experimentation has pushed the speed of these microwave packet transceivers up to 10 Mbps. That's right: ten MILLION bits per second, or about 10,000 times faster than our current TNCs. These transceivers are perfect for a high speed packet backbone.

Kevin Rowett N6RCE also talked about the high speed digital radios that he and Glen Elmore N6GN have designed and tested. These are complete radios that operate at either 900 or 1,200 MHz. They will transmit data at speeds up to 500 Kbps. Unlike the 10 Mbps/10 GHz point-to-point transceivers, the 900 MHz transceivers are designed to operate the same way we now operate: using omnidirectional antennas with many people sharing a channel. The appearance of the PK-186, the DE-56, and the Awesome I/O make these radios very practical. Kevin and Glen are working out how to get these radios available in kit form so that just about anyone can build one.

What Next?

The appearance of all this wonderful, high speed hardware makes it possible for us to implement high speed networks. The big question now is what do we want to do with them? So far there has been little or no change in am-

The ARPANET/Internet

The Internet is the world's first and largest packet switching computer network, consisting of over 20,000 computer systems. Activated on September 1, 1969 as the ARPANET, this collection of four connected computers became the world's first packet switching computer network. Much of what is known about packet switching has come from research done on and with the ARPANET (packet radio had its beginnings as part of the ARPANET many years before anyone even thought of AX.25 or a TNC).

In the early 1980's the ARPANET was split into two pieces known as the ARPANET and MILNET with the ARPANET continuing to function as the experimental and academic network while the MILNET became the Department of Defense's non-classified operational computer network. Also around that time TCP/IP was adopted as the networking protocol standard. This rapidly growing collection of host computers and networks was then renamed as the "Internet."

Today the Internet consists of more than 20,000 host computer systems connected by coax cable, fiber optic, telephone, and radio links. The people who maintain and operate the Internet have set aside over 16,000,000 host addresses so that the amateur packet radio network can be interfaced to and become part of the Internet. Our network has the name AMPR (AMateur Packet Radio).

ateur packet radio operation since its inception in the early 1980s. We still use TNCs at 1200 baud with crummy Bell 202 modems connected to narrowband FM radios. In the digital world this is equivalent to using spark to send Morse code. Given this level of technology, the message switching BBS network that ensued was about the best that we could have hoped for.

Now that we have access to faster services 9,600, 56,000, and 500,000 bps technology will become commonplace. Backbone links will actually run at 10,000,000 bps. The PK-186, the DE-56, and the Awesome I/O make it possible to switch packets reliably at these high data rates. So what do we do now?

Here are some of the applications that I expect a high speed network to provide: digital voice, digital voice repeater trunking, digital freeze-frame video (digital SSTV), computer disk sharing, mobile packet, on-line callbooks, digital FAX, and more. Those are my ideas and desires.

But what services do YOU want a high speed network to provide? Please send your ideas to me care of *73*. Send me ideas for uses but don't spend a lot of time on how it should be done. Just imagine what you could do with a reliable, high speed channel between you and the rest of the ham community; one that is unencumbered by propagation, QRN, and/or QRM. I will print the ideas here (with credit to the originator, of course). I am sure that the hams who build the hardware and write the software will be interested in new ideas, and will see your wishes as a challenge.

"Each port of the PK-186 is capable of over . . . 1 Mbps throughput."

Number 34 on your Feedback card

UPDATES

October 1989 "Tech Tips"

First, let's get Bill Hickox's callsign correct: He is K5BDZ (NOT KB5DZ). Second, he writes that the ICOM power supply is not "internally switched."

Next, he cautions that the method will not necessarily "put you where you left off" when it comes back on. That depends on the model, memory in use, battery backup, etc. But the rig will turn on, and you can proceed with normal operation.

December 1989 "QRP"

Mike Bryce WB8VGE states that there are some errors in the schematic for the August 1989 project, a pulsed battery charger. First, the blocking diode wasn't labeled. It can be a 1N4001 or any diode rated at 1 amp or more. Of course, if you use the LM350 with its 5 amp rating, you'll also need a larger diode—and you'll need to increase the current from the transformer and diode bridge setup. Next, the unmarked resistor on the collector of the transistor is 220Ω. The transistor should be a 2N2222 or equal. Last, the 2.2kΩ resistor is shown as a trimmer, which it is not. Use a 2.2kΩ resistor, and ignore the wiper connection.

Number 21 on your Feedback card

ABOVE AND BEYOND

VHF and Above Operation

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Frequency Counters and Accuracy

In many cases these days frequency measurement isn't critical. Synthesized radios for HF/VHF/UHF operation are more than accurate enough for even narrowband work such as SSB and CW. Even if you had a non-synthesized rig for the above sub-spectra for which you needed to check the frequency, counters abound that give you more than enough accuracy. A common frequency counter basic stability is 1 PPM (part per million)—which is 150 Hz at 2 meters and 450 Hz at ¾ meters. There are frequency counters available, such as the Digimax D-1200, which has accuracy to 0.1 PPM, a factor of 10 better than the standard models, giving you 15 Hz at 2 meters.

This may be accurate enough for VHF and below, but not so for microwave SSB operation. At 10 GHz the above accuracy can range as much as 10 kHz—unacceptable when you consider that SSB signals are typically only 3 kHz wide. Even at 0.1 PPM, the error is still a hefty 1 kHz at 10 GHz.

Getting More On the Mark

First, check these counters to verify your accuracy by using WWV transmissions on 5, 10, 15 or 20 MHz. The best that you can set your time base crystal on frequency with these frequencies is 1 part in 10 to the 7th (0.1 PPM) or slightly better. Just what the doctor ordered to bring the counter back to its original specifications! See Table 1 for specs on the frequency counters available.

You can also increase your counter's accuracy by using an external frequency standard, or a different counter than those listed in Table 1. The Hewlett Packard HP-5245 counter does not have the portability of the counters listed in Table 1, but it is a bench counter of high quality. This basic 50 MHz counter accepts plug-in units, extending its useful range to 16 GHz (see Table 2). The HP counter uses a very high quality 10 MHz internal frequency standard accurate to a few parts in 10 to the 10th for short term stability, and it will hold 1 part in 10 to the 9th easily. That's equal to 0.1 Hz at 100 MHz, or a scant 10 Hz at 10 GHz. Now we're getting somewhere!

You can use only one plug-in unit at a time in the HP counter. All plug-ins derive their basic accuracy from the counter's proportional oven-controlled 10 MHz crystal oscillator. Frequency is multiplied in each plug-in for use in downconverting to the basic counter.

Calibrating Your Counter

Calibration of this timebase oscillator differs. When setting with WWV we can only be sure of part in 10 to the 7th, or slightly better, due to phase shifts in the atmosphere from transmitter to receiver. Besides, the basic counter, if operating properly (in calibration), has better accuracy than WWV "as received." Obviously, we need a better method to calibrate it.

Enter WWVB operating at 60 kHz. At this low frequency, the low phase shift allows the transference of the standard at the transmitter to remote receivers with tremendous accuracy. You can verify a part in 10 to the 9th in short order, and 1 in 10^{10} takes just over eight hours. That's 1 Hz accuracy at 10 GHz—now we're really close to the mark!

At these frequencies, the phase difference between the local standard and the received 60 kHz reference signal is compared, and any accumulated errors (phase difference) in the form of time error in microseconds are tracked. Over a period of time, this will show if the local oscillator is lagging, leading, or right on, compared to the phase of the received 60 kHz WWVB signal. Quite an accurate method. Matter of fact, this is how calibration labs maintain calibration certifiable to the national Bureau of Standards.

> *"I have seen used counters selling for as little as $50 . . ."*

Moral of the Story

Don't scoff at the older counters at flea markets—you just might want to pick one up. A direct cousin to the HP counter is the Systron Downer counter. Their older models look a lot like the Hewlett Packard 5245. Caution: Do not assume the counter is accurate when its internal counter is set to check its own reference. It will lie, lie, lie. Remember that the master oscillator sets the timebase. If the oscillator is out of calibration, everything else will be, too. A good quick check is to use a 150 MHz or 450 MHz HT to make a basic operational check.

Affordable

I have seen used counters selling for as little as $50 and as much as $250. Plug-ins in working condition go for $25 for the 500 MHz unit, $75 for the 3 GHz, and about $200 to $300 each for the 12.4 GHz and the 18 GHz units.

The receivers used to calibrate the high quality standard found in the HP-5245 counters are made by several companies, including Hewlett Packard and Tracor. I use the Tracor 599 60 kHz receiver to calibrate my standard oscillators locally. Check out your local swap meet—one of these just might show up.

5760 MHz World Record

On July 23, 1989 at 0157 UTC, N6CA/6 and N6SNA/6 (CM94XM) worked XE2GXQ/N6XQ (DL37CK) on 5760.1 MHz SSB, over a distance of 613.4 miles from west of Santa Barbara, California, to south of Guerrero Negro, Baja California, Mexico. Signals were 20 to 30 dB out of the noise with QSB, but Q5 99% of the time. XE2GXO/N6XQ was also worked on 3456.1 MHz SSB at 0046Z with similar signals. Both OSOs lasted more than 10 minutes. This 3456 QSO is a North American ducting record. Margaret N6SNA also completed a contact on 3456.

Equipment at both ends was identical and primarily surplus and home-brew by N6CA. W7CNK/WA5TNY designed the 3456 and 5760 antenna feeds. Antennas at both ends were four-foot dishes. Power at 5760 MHz was 4 watts and 1.5 dB noise figure receivers. Power on 3456 MHz was 1.5 watts and a 2.5 dB noise figure receiver. Elevation for N6XQ was 150 feet and about 1600 feet for N6CA.

N6XQ's trip wasn't easy. Fourteen hours of rough roads to the first location, then a six hour drive just to move 65 miles north to his final location. Radio conditions were below normal. Liaison on 2 meters was marginal, so part of the attempt was assisted by 220 MHz FM from N6CA to XE2UZL/W6UZL (280 miles). 28.885 MHz from XE2UZL to KH6HME on Mauna Loa Hawaii, and then to XE2GXQ. Eventually a 2 meter liaison was established at 613 miles. 1296 SSB was 1 to 3 dB out of the noise with 20 dB antennas and 10 watts and 1 dB noise figure receivers.

These are the first amateur contacts between Mexico and the US on 3456 and 5760 MHz.

As always, I will be glad to answer all your questions. Please submit an SASE with your questions for a quick response. 73 until next month . . .

de Chuck WB6IGP

Table 1. Available Frequency Counters

Digimax	D500	50 Hz to 512 MHz	1PPM	
	D510	50 Hz to 1 GHz	1PPM	
	D612	50 Hz to 1.2 GHz	0.1PPM	Proportional oven
	D1200	10 Hz to 1.2 GHz	0.1PPM	Proportional oven
Ramsey	CT-70	20 Hz to 550 MHz	1PPM	
	CT-90	10 Hz to 600 MHz	1PPM	
	CT-125	10 Hz to 1.2 GHz	1PPM	
	CT-90	10 Hz to 600 MHz	0.1PPM	With option OV-1
Optoelectronics		10 Hz to 2.2 GHz	1PPM	

Table 2. Plug-In Modules for HP-5245 Counters

HP-5253	50 MHz to 500 MHz
HP-5254	300 to 3000 MHz
HP-5255	3 GHz to 12.4 GHz
HP-5256	8 GHz to 18 GHz

Number 22 on your Feedback card

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

Thirteen Years of RTTY Loop

From this column's beginning in the summer of 1977, some of the items most requested over the years for "RTTY Loop" have been the "one-night project" and the "simple but useful test equipment." This month I try to address both of these needs.

Finding a signal to tune up with to help set your RTTY station, or just to fool around with, is sometimes hard. While the ham bands are normally replete with signals, that strong continuous one you need is just never around when you need it. What the country needs is a good, five-dollar RTTY signal generator.

While I wouldn't send the signal generated by this month's circuit out over the air, the signal is certainly sufficient to tune up a receiver or demodulator. As for cost, it would be hard to do it for less!

RTTY Fundamentals

Since many of you have indicated a need for more basic information regarding the fundamentals of RTTY, a little theory is in order before we look at the circuit. You may recall from some of our earlier columns that a RTTY signal is really nothing more than a series of binary digits, changes in state if you will, with a maximum rate determined by the speed of data transmission.

"Changes in state" refers to any change in the signal to represent two distinct signals. On a binary circuit, these are nominally referred to as "1" and "0," "on" and "off," or "high" and "low." The terms used really don't matter. What's important is that the two signal levels are representable. With a wired circuit, these two levels are produced by the presence or absence of a current, a change in the polarity of a current, or a change in the level of a current.

In a radio circuit, these same changes in state are produced by changing, most commonly, the frequency of the radio signal. Such a change of the base radio frequency is called FSK—Frequency Shift Keying, while a change in the modulating audio tone frequency is called AFSK—Audio Frequency Shift Keying.

Rate of Transmission

When we encode the pulses that make up a TTY signal via FSK or AFSK, and send them serially down the line, we define a pulse rate based on the maximum speed. That is, the shorter the pulses, the faster the potential rate. While the actual frequency of the signal may vary, depending on the characters being sent, an idealized frequency rate, based upon the shortest pulse, is often used to express the data transmission rate.

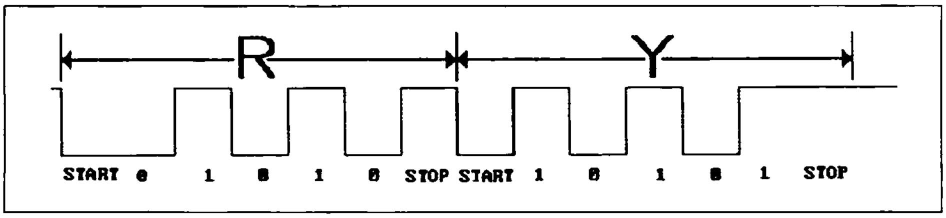

Figure 1. Basic TTY signal.

Figure 1 is an attempt to diagram just such a case. Here, a signal is alternating between an "on" state and an "off" state on a pulse by pulse basis. We thus have the highest possible frequency being sent over the circuit. For the sake of argument, if this is a "standard" 60 wpm TTY system, each pulse is 22 milliseconds (0.022 seconds) long.

You can calculate the frequency by finding the reciprocal of 0.022 sec/pulse, which would be 45.45 pulses/sec. Pulses/second is essentially the same as cycles per second, which we call Hertz. That makes the frequency 45.45 Hz, which, just to throw some more units at you, is also referred to as 45.45 bauds. Keep that number in mind, we will need it later.

Before we leave Figure 1, notice one more thing. The regular sequence of "on" and "off" pulses diagrammed for this exercise form two letters in the Murray, or Baudot, code: RY. Ah, so that's why you use "RY" for testing, I hear some of you say. But just the same, if you had a square wave generator, and set it for a frequency of 45 Hz, you might just find that you had created RY-in-a-box!

Now—The Pulse Generator

Wonder of wonders, can anybody guess what Figure 2 is? Here we used that ubiquitous, cheap 555 timer chip to create just the pulse generator we have been talking about.

Easily assembled on a perfboard, this one-chip project should take about an hour to put together once you have the parts. You can get all of the parts at your local Radio Shack or by mail (see parts list). Feeding it from a battery, it should last almost forever.

The output of the chip, at pin 3, is at TTL level. The simplest way to use it is to send this signal to the AFSK generator (see the August *RTTY Loop* for a simple, one-chip AFSK generator), and obtain a continuous "RYRY" signal you can use for local testing.

Now, one caveat: This is a 45 Hz square wave. Perfect RTTY would have a stop pulse of 31 ms rather than 22 ms (look at Figure 1). That means this signal is not perfect, and will tend to drift after ten to twenty characters or so, depending upon the exact frequency rate. That is why I suggested you *never* put it over the air! But for local testing and alignment, or to provide a frequency shifted signal to set a demodulator, it can't be beat!

Simple RY Generator Parts List

Part	Radio Shack #	Cost
Integrated Circuit:		
555 Timer Chip	276-1723	$1.19
Resistors: (use potentiometers; adjust to exact resistance):		
500Ω pot	271-226	.69
5000Ω pot	271-217	.69
Capacitor:		
10 µF Tantalum	272-1436	.79
Perfboard:		
2.75 x 6 IC punched	276-1395	1.79
IC socket:		
8-pin DIP	276-1995 2-pack	.59

Above All, Have Fun with It

If you have any requests for simple, one-evening devices, or if you have solved any problems like this yourself, please drop me a note at the above address or via the electronic services detailed below, and let me hear about it.

On a related topic, many of you have moved quite beyond making RTTY pictures with characters as we did years ago, into the realm of digitized video that can be transmitted in file format over RTTY and packet, or BBS circuits. While there are quite a few high-end, expensive packages, such as the ones making T-shirts at the mall, several affordable digitizers are now available. Next month we'll take a look at two of them, head-to-head, and see what they can do. I am amazed at the quality these little boards produce.

For now, don't forget to let me hear from you by mail, or via CompuServe (ppn 75036,2501) or Delphi (username MARCWA3AJR). I read every comment!

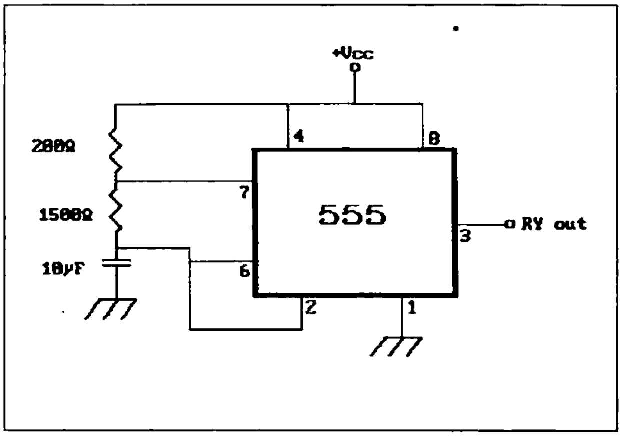

Figure 2. Simple $5 RY generator. Very handy for tuning up your RTTY station when you can't find any strong RY signals on the bands.

Number 23 on your Feedback card

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The *73 Flea Market*, Barter 'n' Buy, costs you peanuts (almost)—comes to about 35¢ a word for noncommercial ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

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Continued from page 4

with you, but I enjoy your editorials."

Hmmm, if they don't agree with me on something, is it their ignorance or mine? Very few readers have enough confidence to actually write to me when they disagree.

As one of the founders of American Mensa, I've talked with hundreds of people with outstanding brains. I can assure you that a distressing number of them are poorly educated and that they don't let this interfere with their ability to hold strong opinions, no matter how wrong.

There's a tendency to think of education as ending when one gets out of school. That may be true for the functionally illiterate. How many books have you read recently—other than novels? My library has over 6,000 books I've read—plus I read about 1,500 magazines a year. The reason I'm able to write on a wide variety of subjects with confidence is because I do my homework.

It doesn't take a high IQ to be able to read. All it takes is the perseverance. Does that sound familiar? Tsk, you didn't read Ray Croc's book on success. Croc? The McDonald's chap—tsk again. Yes, you have to work at it to be educated. You also have to work at it if you want to be successful. The prizes for both are well worth the effort.

My trips in recent weeks have given me the time to catch up reading a few books. If you're interested in my diving trip, call our BBS and get a dump of "Diving, The Wimp Sport." You'll enjoy it.

Hey, if you're into scuba diving (and good at it), maybe we can get to some Caribbean islands for a joint ham and scuba DXpedition. If you're into skiing I can't understand why you haven't been joining our ham ski group in Aspen for the last fourteen years. We'll be there January 9–15th, HTs ablaze. We have both intermediate and expert skier groups

Having been getting senior citizen discounts for some five years now, I obviously have an added impetus to learn more about the "next world." But this also ties in with amateur radio. If you're interested in a very complete book on cosmology and the latest thinking about there being alien civilizations, check out *The Anthropic Cosmological Principle* by Tipler. It's an exhaustively referenced scientific work.

The main reason scientists give for being sure there aren't any other intelligent civilizations is that we haven't heard any radio signals from them. Hmmm. Isn't it a tad arrogant to assume that we will never discover a better communications medium than radio? Heck, even a laser beam would have a much wider bandwidth and be better focused than radio signals. There could be laser communications all over our galaxy and we'd never know it. And if a faster medium is discovered, radio would be about as useful as smoke signals.

Ants and termites work both as individuals and as groups and thus have some means of group communications. Even people behave entirely differently in a group (mob). How's this work? How is this communicated? We do have some hints as to other communications systems, we just have had a cultural bias against investigating these things.

Another book, *Voices of Eternity* by Estep, explained how she set up rudimentary communications with the spirit world using a VHF radio and a tape recorder. A chap named Raudive wrote a book on this about twenty years ago, but his results weren't nearly as convincing. It seems that our "silent keys" may not be as silent as we thought. I'm going to set up a test system which will be thousands of times more sensitive than the one Estep is using and see if I can get in touch with Mort Kahn W4KR and see what he thinks now about Incentive Licensing, which he put through when he was running the League 25 years ago.

By the way, I realize that communications with the dead—particularly with the dead of other solar systems—is ridiculous. That's nut house fantasy, right? Alas, I have it from two personal sources that not only is this possible, but our beloved government has already invested hundreds of millions in the project. With any encouragement I'll start a magazine to help this new communications field develop.

Now, is that Wayne being controversial again? Are you tending to disagree with me? Not if you are educated in this, you aren't. If this is controversial for you perhaps it's because you need to read more.

Is Africa Hopeless?

A *QST* editorial by Dick Baldwin stirred up controversy (tsk) by suggesting the collection of old ham gear to be sent to Africa to help develop more hams there. Why controversy? Well, the cynical view is that Baldwin is just trying to get more action for *QST*'s Honor Roll addicts—which, unfortunately, is about all that would probably happen.

Unless one has actually visited Africa it is difficult to understand what is and has been going on there—and what this means for the future. Baldwin mentions that outside of South Africa there are less than a thousand hams in Africa, and those are mostly Europeans. I wonder if there are even a hundred Black hams in all of Africa. Heck, look how few we have here in America!

The Black countries I've visited in Africa over a period of years are all running down—falling apart. The lack of education and communications has made it simple for dictators to take over and plunder what little there is to take—including as much from American banks as they can get to salt away in Swiss accounts or spend on showy but useless projects. Now our banks are at a loss—the money they've lent has been wasted, so the countries have no way to pay the interest, much less pay back the loans. There's not even a way to get the money they need to develop their economies so they can

start paying back the old loans—and we have no assurance that further money wouldn't go the same route as the last hundred billion or so. Just what this massive bank stupidity is going to do to the world financial system is still unknown, but many economists are terrified that the facade of possible repayment may crack, setting off a world panic.

We know American investors are getting very edgy about the continued build up of our stock market. We're hearing warnings that the Tokyo stock market is incredibly over-expanded and ripe for a crash. Even a mini-panic could send it into a free fall, building up momentum on margin calls which can't be met—the same as happened here in 1929–30. Would that pull our market down too? It easily could.

careers. The cost is relatively low—teaching materials for classes, club ham stations and computers. If our banks had sent this type of help to Africa instead of billions in cash, we'd be seeing major changes there. And the cost would have been peanuts by comparison.

Would this work? I know it would, because that's exactly what I did in Jordan and it sure worked there. There are more Jordanian hams today in that tiny country than Black hams in all of Africa, including South Africa. This is the reason that Jordan is by far the most technologically advanced of all the Arab countries.

As you can see, I tend, for a change, to agree with Baldwin's critics. Sending ham gear to Africa right now, I feel, would be a waste of time and money. It

"As you can see, I tend, for a change to agree with Baldwin's critics."

With so little education and communications in most Black African countries, there's no way for them to develop business. The local market is too small to help businesses get started. There are few educated people to start and run businesses. The purpose of the bank loans was to break this circle of poverty, but without strong controls (which the dictators refused to allow), the money just evaporated—billions of our American hard earned dollars. Let's not forget just who had to earn all that money our banks have thrown away.

What can be done to help Africa? I don't think there's anything that hams can do to change things. Without education, there's no way to get better African leaders. The leaders know this, so they're not encouraging education since that would eventually lead to their losing power.

If we want to blame anyone for the Catch-22 in Africa we can dump on the colonial powers who all had policies of keeping the natives uneducated so they could exploit their resources without organized opposition. It worked fine until the countries were suddenly cut loose in the '60s.

My approach would be to find one or two of the 59 countries where there seems some hope of developing education. Not all are being run by despots—just most. I'd visit them and talk with the presidents, explaining the importance of electronics and communications to the future of their country. Then I'd explain that the only practical way to cope with this is to develop native engineers and technicians. The best way to do this is to start teaching the fundamentals of electronics and communications in their elementary schools.

By supporting these fundamental courses with radio, electronic experimenting and computer clubs, children would be encouraged to take a personal interest and head toward technical

would just go the route of the billions of our dollars already shipped to Africa—wasted.

If we can get one or two countries started teaching their kids the fundamentals of electronics, communications and computers, then we'll have a need for collecting old ham gear and computers and shipping them to Africa for use by clubs. Until then, let's cool our normal American generosity—let's leave that to our banks—the same banks which don't want to talk with us when we need money can't seem to find big enough shovels for dictators. . . and even our very good friends in communist countries. Incredible, isn't it?

Museum Progress

As a fifty-year member of The League and legendary League supporter, I'm excited over the plans for the ARRL Amateur Radio Memorial Museum and Visitor Center. This recently funded multi-million project seems to be progressing nicely. You may be interested in some of the rumors I've heard.

The architects have been instructed to work on a plan for making the new building so it would look exactly like the fabled Hallicrafters Skyrider Diversity receiver, in honor of the Hallicrafters Company, which so heavily "endowed" the League during its heyday. A new art deco building like this could attract national attention.

Some of the directors favored making it look like the National HRO receiver, but when it was found that the only surviving museum-quality prototype HRO would have to be purchased for a pretty penny from the fabled *73 Magazine* Amateur Radio Memorial Museum, the directors were dissuaded.

Even with the delays in the design of the building, the exhibit acquisition program is said to be already well ahead of plan. Despite a surprisingly

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vigorous bidding war, the League is reported to have managed to get a set of tapes of the activity on 3999 kHz for a 24-hour period in 1963—surely a historic treasure, and worth far more than the measly $50,000 asked.

Another great exhibit is expected to be a complete set of Don Miller's 1960s fake DXpedition logs. There is also said to be a large exhibit of faked QSL cards which have been submitted for DXCC credit. Yes, Frank, yours are all there.

Still in negotiation is a set of tapes containing a one-month certified record of all activity on the 220 MHz amateur band in the 30 largest American cities for February 1986, rumored to be an exhibit prepared by UPS to demonstrate the almost total lack of actual amateur radio activity on the band. Since most of the tapes are blank, there is some question as to the value of the exhibit to anyone other than UPS.

A ham attorney in Southern California has offered a set of 10,000 hours on audio cassettes of Southern California repeater jamming and profanity. The Board hasn't decided yet what to do about this prospective exhibit. With expletives deleted it is estimated this could be edited down to about two hours of drivel.

Editing is still being done on an exhibit of video interviews with the only two persons ever tried, convicted and put in prison for using obscene language on CB. Both are Extra Class hams. They both had interesting, though unprintable, views on the new ARRL museum project. Prison seems like a particularly odd place to send people to try and cure them of using bad language.

The Southern California DX Association is said to have offered an audio tape of the 100 largest DX pileups in history to the Museum as an exciting acquisition.

If you have any ideas for amateur radio memorabilia which might help the directors, you might send them to the ARRL Amateur Radio Memorial Museum at Newington CT 06111—copy to me.

It's been suggested that since I'm not a League official it's incumbent on me to start an unofficial building fund campaign to help pay for the substantial cost overruns which the Museum project now seems certain to incur. It's something which should (must) be done, but it's only fair to point out that since my constructive suggestions to the League in the past have been blown all out of proportion, I insist that others undertake this critical responsibility.

Public Education

This is almost an oxymoron today. We in amateur radio in particular have been the victims of the American public educational system. The time was when the average high school student had more than enough science education to pass the Novice theory test. Today, with under 10% of our kids even being exposed to the fundamentals of physics, much less electricity and electronics, is it any wonder our source of life for amateur radio has dried up? The last figures I saw showed our newcomers had dropped 35% in the last three years. How dry can it get?

The American educational system has failed our country massively. It's been taking longer to teach less, changing amazingly just in my lifetime—and most of yours. The lack of basic science education has made it possible for America to lose its consumer electronic industries, one after the other.

But the situation is far more serious than our loss of technology. Today we're awash in crime and drugs—we're having to live with ethical situations we don't understand, with our children living together, but not married—with a high percentage of fatherless families—with divorce rates which are incredible—with lawyers running amok and politicians stealing us blind at every turn.

All this comes down to a lousy educational system. Kids who grow up to be criminals must have gotten educated to that somewhere, right? The easy scapegoat is the family—what's gone wrong with the family? That comes right back to education again. Families today are the products of our educational system.

Our system provides relatively cheap and government enforced babysitting for all kids over five. This made the two-parent working family possible. The increased earnings of two wage earners first gave them better houses, cars and all the other things our educational system has established as life goals. Naturally the prices for these things increased, making it necessary for there to be two wage earners just in order to maintain the status quo. Tough.

We hear at every turn that the drug situation is one of education. So what are we doing about it? Not one approach I've heard about so far has claimed to work. When are we going to face up to the fact that our public school system is not teaching kids the truth about drugs? We're also not teaching much about ethics, getting along with people, cooperation and a depressingly long list. Our public educational system is a $100 billion disaster—a dinosaur.

The bright side of this is that there have been a growing number of books recently exposing the rottenness of our system. Even the educational magazines are getting more militant about this—and I subscribe to over a dozen of them. If you're interested you might look to your local library for *Kappan*, the Phi Beta Kappa magazine, to *The Education Digest* and to *T.H.E., Technical Horizons in Education*.

Okay, so the time is getting ripe for a change. What can we do about it? By now we know better than to fight City Hall. We can't win a direct confrontation with a $100 billion a year government monster. No, but we can come in from left field before the bloated, malevolent monster wakes up to what is going on.

The weakness of any monster is its resistance to change. Our military took a terrible drubbing in Vietnam by resisting the changes needed to meet the local circumstances. You can see many examples of how new, innovative companies have sprung up and toppled huge industries. The Swiss used to have the watch industry all to themselves. Along came the digital watch and put their whole country out of the business.

By the way, it was America that started the digital watch business. I've still got a box of the early American digital watches. Then Japan came along and killed us with lower cost and far more innovative watches. They invented circles around us and put our watch companies out of business.

this inability to work for the long run which has made it possible for us to live with a public educational system which has grown to a $100 billion a year government operation. No well-educated kid would smoke cigarettes or chew tobacco. No educated kid would be stupid enough to get hooked on heroin or cocaine. Would kids even drink beer if they really understood all the pros and cons involved?

If our educational system leveled with kids it would explain that they're being manipulated by the alcohol industry to think that it's grown-up to drink. Is it really? Or is it even more grown-up to be able not to drink, even when pushed by peers? I used to feel this pressure, but once I figured the whole thing out I had no more problem

"It's difficult to get people to work for the long run. This takes education."

Okay, our public educational system is a horrible failure. Kids aren't learning to read and write, they're left wide open for the seductiveness of drugs, early sex, having illegitimate children, getting involved with crime, accepting divorce as a substitute for a more intelligent marriage system and so on. I don't have to tell you all that's gone wrong. You see our kids hanging around shopping malls, smoking cigarettes, buying drugs. You see them cruising in pickups and on motorcycles.

We wonder if the plethora of crime programs on TV are an exaggeration. Then we read the statistics on drug smuggling and drug murders and we know what we're seeing is more reality than the lurid creations of fiction writers.

We see our kids buying alcohol and getting killed by the thousands in car crashes. Those of us in the country see empty six packs by the roadside, thrown out by teen-agers sitting in their cars drinking. We see the tire marks where they've challenged each other. We read about their accidents and attend the funeral services. Who among us hasn't experienced the loss of a friend through alcohol? Very few.

I say this is a failure of education—a failure of our public schools to teach our children how to live in the world of today. We have the transportation and communications to make anything available we want. If we want drugs from Burma, they'll get here and no escalation of our war on drugs is going to stop them.

Yes, we can cancel the laws against drugs and cut their growth by eliminating the profits, but we're still going to have to do what we haven't done—teach kids the facts about drugs—why they are so attractive—and why they are so destructive.

It's difficult to get people to work for the long run. This takes education. It's with it. I don't drink and you're not going to make me.

Who, besides another drunk, likes a drunk? Oh well, we're talking social drinking, not drunk—right? No, it's a matter of degree, that's all. Even one drink makes you a little bit drunk. You reduce your ability to think, to coordinate. One drink and you are a worse driver and thus more likely to kill or maim yourself, your family, friends and others. The drug affects your thinking, making you resistant to reason.

Did you see the Richard Pryor movie where he talked about his drug addiction? Too bad—you missed a powerful, hilarious and terrifying, account of how it is from the drug addict's side.

Our educational system should prepare our kids to cope with the pressures they're going to experience—from the media—from peers—from criminals. They should be better able to cope with the enormous money pressures pushing tobacco, alcohol, cocaine, crack, heroin, uppers, downers, gambling and so on.

Okay already, there's a problem, so what's Dr. Green's solution? Well, I'm not one to bring up problems—even such severe ones such as these—without offering a practical solution. It's going to take one whale of a solution. We're talking about either fixing or replacing a public educational system which has been deteriorating for over a hundred years—with tentacles in every part of our country—a system supported by public taxes, both state and federal. This is a Very Big City Hall.

If we try to fight public education head on we're going to be lighting every branch of the federal government which can be brought into play. We're going to have congress, the administration, the courts, right on down to the local boards of education in your town ready for mayhem. I'm talking FBI, CIA, IRS, and every other initial combination you've ever heard of. That's one whopping City Hall!

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ADVERTISERS

Issue #352

*Advertisers who have contributed to the National Industry Advisory Committee (NIAC).

Guerrilla warfare might work—it's pretty successful around the world. But that's fighting the enemy from the flanks and the back. It's better than head on, but it's slow and painful. It also usually leads to frustrations which in turn bring terrorism.

No, what we need here is a sneaky new approach—one which can be built into a juggernaut before public education realizes what's happening. Yes, we have just what we need in the tools to make this happen. It has the added benefit of appealing to the profit motive. It's capitalism at work, fighting our decayed socialist public educational system. Capitalism has outperformed socialism and communism in every country of the world. There isn't one showcase for communists or socialists to point to with pride—and that certainly includes our socialized public school system.

Capitalism has, on the other hand, a growing number of phenomenal success stories such as America, Japan, Korea, Taiwan, Hong Kong, Singapore and so on. The difference between Taiwan and China is night and day, yet these two have exactly the same people—it's just the political system which is different.

Even the U.K., which was rapidly self-destructing under socialism, has been making incredible strides under Thatcher's management.

Money (power) is the driving force. It's why the drug "war" is being lost—indeed can't be won. It's why people are allowed to smoke tobacco in spite of everything we know about it—in spite of it killing 35,000 people a month just here in America. It's why we put up with our kids killing each other with drunk driving. Money will defeat altruism and good intentions every time.

We're at a particularly serendipitous time in our history. For the first time we have at hand the tools we need to come in from left field and topple public education. I'm not talking repairs, I'm talking our taking no prisoners. I'm talking our getting rid of the monster once and for all, but doing it so it never knows what hit it.

Schools apparently haven't taught the basics of freedom in ages, so few kids even have a sense of what it means. I used to be really angry at the federal laws forcing kids to go to school—mainly public school. I couldn't see the difference between that and slavery. I still can't.

Of course, I don't see the difference between the draft and slavery either—except that one is legal and the other isn't. We still condone legalized slavery of kids—and it's the first thing we think of when we need to build up the military. . .let's round up the slaves.

The main tool we have immediately available is video. With VCRs in most homes these days this is a simple and profitable entry for the New Education. The next step is to use an interactive educational medium such as interactive compact discs (CDI), but that's down the pike. It's too expensive right now. We might find a way to develop interactive video tape systems which would work with our present VCRs. In the meanwhile there's an enormous market out there right now for educational videos—a market which is virtually untapped.

The first videos should be aimed at adults to re-educate them. Until adults decide that education really is important for their kids, the kids aren't going to be motivated to bother learning. Oh, we can sugar-coat the educational system, making it fun to learn. That'll help and is long overdue. The slavery system of forcing kids (sometimes laughingly called "students") to sit through endless drudgery imposed by indifferent and ill-prepared people we call "teachers" has so deadened kids to the concept of education that we have our work cut out for us.

There is a good deal of anger at the newly arrived Asian kids who are running circles around good old-fashioned American kids. If you've watched TV, you know that the only real difference between these Asian geniuses and our dolts is that their parents don't take any baloney. Their parents have convinced their kids that education is important, so they're making the best they can of our sick system—and beating American kids at every turn. So first we have to educate the parents. Sigh! No, I didn't say this was going to be easy, just that it was important and would be very, very profitable. Money!

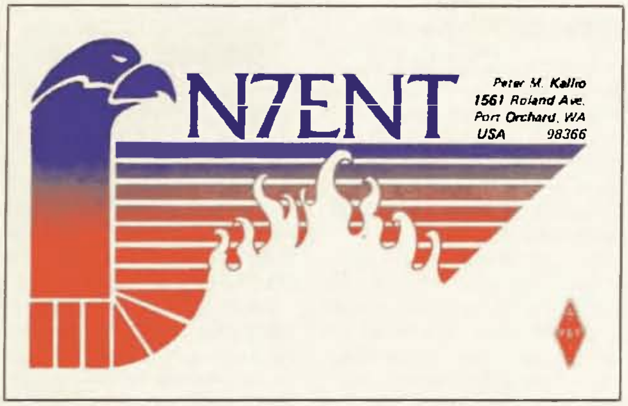
American parents, I believe, are ripe for this educational revolution. I believe they'll go for videos on how to help their kids succeed. That's one trait that hasn't been completely beaten out of us—we still hope our kids will be able to do better than we have. As we see them going for drugs, drinking, sex, cruising, petty theft, lying, and ignoring school, we know we've let them down—but we don't know just what we should have done. How did we fail them?

Every parent who's tried to deal with a kid on drugs, in jail, going off with the Moonies, turning gay or suddenly pregnant has asked where they've failed. They hear that it isn't they who've failed, it's the schools. Baloney. We've let our kids fail—and we've let our school system turn to pap.

Once we have some videos teaching parents how to parent we're going to need videos for the kids on how to kid. They'll need videos not only on every subject they've been short-changed on in school, they're going to need them on the subjects which should be being taught in school and aren't.

Can kids of ten understand videos on peer pressure? On personal ethics? On coming to grips with sex? Oh horrors, I can hear the religious groups screaming at me that sex should be taught in the home—or in church. Well, it isn't and it isn't going to be in any future now imaginable, so let's stop using this as a way to worm money out of gullible parents.

We see all kinds of video programs showing us how exciting crime can be. Yes, the criminals get killed, but we realize that in real life most criminals



QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock NH 03449, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

get away with it—that this is just a distorted morality play we're watching. We read the papers, so we know that the average income for the crime syndicate people is over a million a year. We see the figures on how many tons of cocaine are smuggled into the country as compared to that stopped, so we know there are riches out there for the taking, no matter how badly the TV criminals end up.

Heck, we don't believe the TV cops either—except perhaps those on the Hill, who live on only in reruns.

We need videos to help parents learn how to educate their kids. We then need videos to help the kids cope with their problems—plus more to help them move ahead. Science videos could help kids come to grips with the fundamentals of electronics—and to get excited about amateur radio.

No, I don't think we can do it all just with videos. I think we need the print media to help, too. I have in mind monthly magazines for kids, aimed at each educational sector—electronics, geography, politics, language, reading, math and so on. Magazines can bring an immediacy which text books will never have. Magazines can bring previously dull subjects into focus and make them much more interesting.

How many school geography courses use the *National Geographic* as a text? How many bring in *The Scientific American* and discuss the articles? We have the basics already going for us, we just haven't seen them in that perspective.

With monthly magazine support we can get our kids interested in amateur radio, computer clubs, astronomy clubs, science fair projects, archaeological digs, local social programs, junior chamber of commerce. We can go back to the high school of my youth where we had over 120 after-school clubs from which to choose. Yes, that was 50 years ago, before the public educational system destroyed them. They're all gone now and my wonderful old high school was presented on TV a few years ago as one of the most dangerous schools in the country. What a testimony to public education!

I have a difficult time with things like this—things where obviously someone should DO something. I grouse about it. I look around to see if anything is being done. Then, out of frustration, if no one is going to do anything—I will. I get myself in all sorts of trouble that way. Sometimes spectacularly. Sometimes I pull a winner, as I did with getting repeaters accepted back in 1970, in getting microcomputers going in 1975 and compact discs in 1985.

I know what needs to be done. I know how to go about doing it. But it isn't anything I can do alone. I'm going to need all the help I can get. We're talking revolution here. We're talking about replacing a government $100 billion bureaucracy with $100 billion capitalist businesses. We're talking about tens of thousands of small businesses and hundreds of huge ones. We're talking about small firms making special videos. We're talking about mail order and video store sales and rentals. We're talking about advertising from national to local. We're talking a whole new type of teacher—one that's fun and exciting. In my whole time at college I had exactly one such teacher, so they're rare. There's one at Dartmouth teaching French.

We're not only talking the starting of magazines for each educational subject, we're going to need educational industry magazines to help these new products be rated and reach the customers. We're going to need writers, talent, video studios, music, editors, video duplicating plants, marketing firms, sales literature, advertising—the whole nine yards.

I'll be interested in your reaction. Some readers will come up with endless reasons why it won't work. Others will fight change to the bitter end. A few will say, hey, that's one heck of an idea, what can we do to help?

I like the idea because it doesn't take much to get started. And once it gets going, there isn't any way to stop it. Money talks. ■

NEW PRODUCTS

Compiled by Linda Reneau KA1UKM

PRODUCT OF THE MONTH

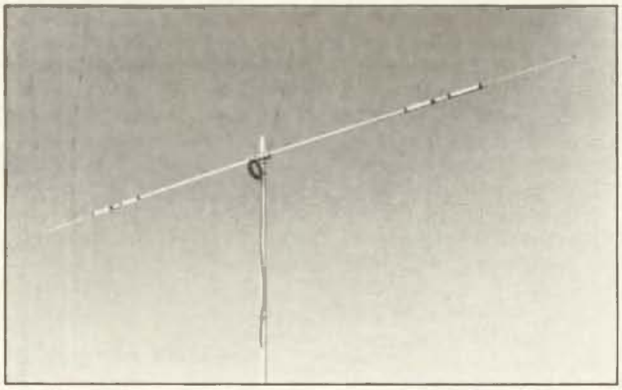
THE YAESU FT-1000

The FT-1000 was designed especially for DX operators. It has direct digital synthesis (DDS) for low noise and fast lock-up time. It also features adjustable 200W RF power output, built-in TCXO for frequency stabilization, independent filter selection, dual receive with balance control, and two tuning knobs for simultaneous reception.

Transmitter band range is 160–10m; receiver range is 100 kHz–30 MHz. Frequency steps are in 10 Hz or 100 Hz, depending on emission type. Maximum FM deviation is ±2.5 kHz. The FT-1000 offers three FSK and two packet shift frequencies.

Other features include a CW spot control, to align your frequency to the incoming signal without transmitting; direct keyboard frequency entry; front panel RX antenna selector; built-in cascaded filter, and dual-mode noise blanker. The receiver front end uses a four JFET up-conversion mixer.

The FT-1000 measures 420mm x 150mm x 375mm and weighs 25.5 kg. Suggested retail price, $3400. With options, $4400. Contact *Yaesu USA, 17210 Edwards Road, Cerritos CA 90701. (213) 404-2700.* Or circle Reader Service No. 201.



CUSHCRAFT CORPORATION

The Cushcraft D3W rotatable WARC dipole covers 30, 17, and 12 meters. You can easily mount it on any 1½–2 inch mast, with your tri-band and other antennas.

The D3W features automatic frequency selection, high Q traps, heavy wall tubing, and stainless steel hardware. It's 34' long, weighs 11 pounds, and is rated for 2000 watts PEP.

Price, $200. Contact *Cushcraft Corporation, PO Box 4680, 48 Perimeter Road, Manchester NH 03108. (603) 627-7877.* Or circle Reader Service No. 205.

ELENCO ELECTRONICS, INC.

The Elenco SG-9500 signal generator/counter combines in one unit a generator able to put out frequencies from 100 kHz to 150 MHz, and a built-in, switchable frequency counter which measures external frequencies up to 150 MHz.

Features include: accuracy is 1 ppm; RF output 100 mV rms (up to 35 MHz); output control 0 dB–20 dB fine-adjustable switch; 1 kHz internal AM modulation; crystal oscillator HC-6/V holder; input voltage less than 50 mV; gate times selector 0.1 sec and 1 sec.; and input impedance of 1Ω for HF and 50Ω for VHF.

Price, $350. Contact *Elenco Electronics Inc., 150 W. Carpenter Avenue, Wheeling IL 60090.* Or circle Reader Service No. 202.

MFJ ENTERPRISES, INC.

The MFJ-850 line voltage monitor protects against low voltage brown-out that can damage your equipment. Plug it in, and it tells you at a glance when your line voltage is at a brown-out level.

The color-coded scale reads from 95–135V. Accuracy is ±2%. Leave it plugged in for constant monitoring.

The MFJ-850 measures 2¼"x2¼"x1½". Use it in your boat or RV as well as in your ham shack. It's especially useful for checking portable and temporary electrical setups. Price, $20. Contact *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762. (601) 323-5869. Order at (800) 647-1800. FAX: (601) 323-6551. TELEX: 53-4590 MFJ STKV.* Or circle Reader Service No. 203.

PALOMAR ENGINEERS

Palomar Engineers announces a new series of high power baluns. Rated at 2 kW CW and 6 kW PEP, the Model MB baluns operate from 2–30 MHz. 50Ω input goes to a Teflon-insulated UHF connector (or an optional N-connector). Balanced output is to two cone insulators. Available output impedances are 50, 75, 100, 150, 200, 300, 450, and 600Ω. MB baluns, in cast aluminum cases filled with epoxy, are weatherproof.

Prices range from $100 to $165. Contact *Palomar Engineers, PO Box 455, Escondido CA 92025. Phone (619) 747-3343.* Or circle Reader Service No. 204.

SYSPEC INC.

The OVP-12, an overvoltage protection network new from SYSPEC, is supplied as an "open" printed circuit board to facilitate mounting for various applications. Designed to protect solid state equipment 8–30V DC from damage caused by power surges, failures, transients, and spikes. Fast response ensures protection during momentary as well as sustained conditions of over-voltage.

The OVP-12 is connected across the unit, beyond the system fuse/breaker. When over-voltage occurs, the device triggers into the low impedance state and trips the fuse/breaker. You can mount the OVP-12 inside the power supply cabinet, inside the system, or as a stand-alone in a user supplied enclosure.

The OVP-12, 1 7/16" x 2 1/16", is priced at $25, including shipping. Order from *SYSPEC Inc., PO Box 2546, Syracuse NY 13220. (315) 699-7513.* Or circle Reader Service Number 207.

Continued from page 15

and ground pins for the LM324 op amp. This chip uses pin 4 for power and pin 11 for ground. I used a wall mount 14V DC power supply regulated by a 7812 three-terminal regulator to power my device. If you do this, be careful. The wall mount power supply that came with my Uniden scanner has a three-prong grounded wall plug, and the DC ground is apparently referenced to the AC ground. This caused my error meter to peg low when I attempted to connect a scope or frequency counter to the test set that used a three-wire power cord. To solve the problem, I used a three-wire to two-wire converter on the scanner power supply to eliminate the ground loop between the scanner and the test equipment.

You can order suitable milli- or microammeters from Mouser Electronics. Ideally, the frequency error meter should have a 5-0-5 unit scale and the deviation meter a 0-6 units scale. This allows you to directly display up to 5 kHz of frequency error and up to 6 kHz of deviation. I designed the driver circuit for the meters to be flexible enough for much freedom in meter selection.

Calibration

If you have access to a service monitor, use it to tune up this device. If you invest a little time, you can generate a table of meter readings vs. actual conditions, and your test box will be a secondary standard to your service monitor.

If you're not lucky enough to have access to a service monitor, don't worry. You can use a new or recently calibrated transceiver equipped with both DTMF and subaudible tone encoders to use as a signal test standard. After you have carefully checked your construction work, turn on the power to the board. Use a voltmeter to test for power and ground in all the required locations. Ground the audio input and the frequency error meter should peg to the frequency low side. The frequency deviation meter should read zero.

If your board passes the above test, it should be safe to connect it to the scanner. After connecting the scanner, turn it on. The scanner should operate normally, as before. If it doesn't, turn the power off immediately and investigate. Once the scanner operates properly, adjust VR1 until the error meter oscillates around zero with no carrier present.

Connect your test transceiver to a dummy load, turn its RF power output down to minimum, and remove the antenna from the scanner. Set the transceiver and scanner to the same frequency and key the mike. Adjust VR1 until the error meter reads zero. With the mike still keyed, press "1" on the DTMF pad. DTMF encoders are set at ⅔ system modulation. For narrowband FM this is 3.3 kHz of deviation. Adjust VR2 until the deviation meter reads 3.3 kHz. Turn on the subaudible tone encoder and key the transceiver. Note the meter deflection, but do not make any adjustments. Subaudible tone signaling encoders are typically set to 750 Hz of deviation. For future reference, note this meter reading and the one made while setting VR2.

Set the transceiver frequency 5 kHz high. Key the mike and adjust VR3 until the error meter reads full scale high. Set the transceiver 5 kHz low and again key the mike. Ideally, the error meter should read exactly full scale low. Practically speaking, you will probably have to compromise between the frequency high and frequency low meter settings (this is where the not-quite-test-instrument-quality comes in). Your test box is calibrated. Now, what can you do with this little jewel?

Operation

When setting up a DTMF encoder, set the modulation to 3.3 kHz on the deviation meter. If you are adjusting the output of a subaudible tone encoder, set the modulation to the meter reading you obtained during calibration.

If you are using this test set for bench work, simply connect your transceiver to a dummy load, take the antenna off the scanner, and go to work. The leakage coupling between the two units is more than enough for testing. (Don't EVER connect the transmitter output directly to the antenna input of the scanner or you will destroy your scanner!) With the antenna installed, you can analyze any signal you can hear over the air.

The tests and measurements you'll be able to make with this simple, two-chip device will amaze you. I hope you enjoy using the Poor Man's Service Monitor. 73

Bill Crowl N6MWS, first licensed in 1985, also holds a Commercial Radiotelephone Operators license. Bill has spent the past nine years employed in the field of electronics, and is currently employed as a Sales Engineer for Selectone Corporation. He can be reached at 8157 Auberry Drive, Sacramento, CA 95828.

Continuous Tone Coded Squelch System

Subaudible tones range from 67–203 Hz, and are used by both transmitting and receiving stations for selective call operation. This system is called Continuous Tone Coded Squelch System (CTCSS). Hams often refer to this type of signaling as "PL," an acronym for "Private Line," Motorola's trade name for CTCSS. Subaudible tones keep a receiver quiet (even when a carrier is present) until the proper subaudible tone is received.

Tone access is often used on VHF amateur repeaters to prevent long distance skip signals from falsely activating a wide area coverage repeater. In commercial service it permits multiple groups of users to share the same RF channel without unduly disturbing each other.

Number 28 on your Feedback card

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston TX 77083

OSCAR 9, 13 Troubles

During the early morning hours of October 9, 1989, the on-board computer (OBC) of AMSAT-OSCAR-13 crashed. Then, on Friday the 13th, the Dow-Jones Industrial Average look a nearly 200 point drop and UoSAT-OSCAR 9 re-entered the earth's atmosphere—unsuccessfully. It was not a fun week.

On October 9, many operators discovered that the workhorse satellite for enthusiasts everywhere, OSCAR-13, was not on schedule. Repeated attempts to use it failed. AMSAT bulletins carried the bad news: Cease attempts to use OSCAR 13 until further notice.

When OSCAR-13's computer crashed, the satellite automatically switched to Mode L beacon with output on 435 MHz. Later in the day, Peter DB2OS, OSCAR 13's primary ground-control station, sent a RESET command to the satellite. It then switched to Mode B transponder operation using the 435 MHz uplink receiver and 2 meter transmitter with the omnidirectional downlink antenna. All was not lost. The bird could at least accept ground-control signals, but the bulletins remained the same: All operation through OSCAR-13 must end till further notice.

Experienced satellite operators monitoring the crisis were quite concerned. AMSAT-OSCAR-10 has been uncontrollable for years due to computer memory failure, while the two UoSAT spacecraft were almost lost due to software problems early in their life. There were no obvious reasons for A-O-13's computer to fail.

Less than a day after going silent, the general beacon transmitted 400 baud PSK signals. The repeating message read DB2OS TELEMETRY PROGRAM V2.0 VIA VK5AGR. Graham in Australia, another designated ground-control station, had successfully loaded a short routine into the satellite's computer. Later, DB2OS loaded more software into the satellite. The high-gain downlink antenna was switched in and bulletins from AMSAT were optimistic. Although it took a few extra days to get transponder operation software loaded into the satellite's computer, the results were a great relief to satellite enthusiasts. On Friday, October 13, DB2OS declared A-O-13 operational and available for use. Although the schedule did not include any Mode S (70 cm up and 13 cm down) time, at least the satellite was working.

"RUDAK is a digital, packet radio transponder using four 23 cm uplink frequencies and a single 70 cm downlink."

Why?

What caused the crash? Will it happen again? The malfunction could have occurred for any one of several reasons. A few possibilities include high solar radiation, which may have introduced a single-event upset in the processor circuit or a double error in the memory. Garbled commands or transponder schedule changes may have contributed. Hams around the world are to be commended for honoring the cease-operation request, and allowing designated ground-control stations the opportunity to try to make OSCAR-13 a functioning hamsat again.

The Descent of U-O-9

On October 16, through a University of Surrey announcement, Max White at the Royal Greenwich Observatory reported that U-O-9, the British scientific amateur radio satellite, re-entered the earth's atmosphere on Friday the 13th at 0752 UTC, somewhere over the South Pacific. This satellite had performed exceptionally during its eight-year life and nearly 45,000 orbits.

Launched October 6, 1981, on board a Delta rocket from the Western Test Range in Vandenberg, California, U-O-9 was built to promote greater interest in space engineering and science in schools, and to test novel technologies. Its downlink frequencies ranged from 7 MHz through 10 GHz. U-O-9 broadened the amateur satellite program by giving amateur experimenters and scientists around the world the use of a small, inexpensive, yet sophisticated educational spacecraft. Although U-O-9 will be missed, UoSAT-OSCAR 11 continues to perform similar duties and UoSATs D and E are scheduled for launch with the Microsats.

False Alarm

On October 14, OSCAR 13's Mode JL (2 meters or 23 cm up and 70 cm down) did not come on. Once again hamsat enthusiasts became concerned. This time their fears were quickly calmed when Mode B (70 cm up and 2 meters down) was activated when expected. An unannounced schedule change was responsible for the lack of Mode JL that day. New experiments by DK1YQ in West Germany with RUDAK (German acronym for Regenerative Transponder for Digital Amateur Communications) required the JL transponder system to be off.

RUDAK is a digital, packet radio transponder using four 23 cm uplink frequencies and a single 70 cm downlink. Due to unknown problems, the system has been unusable since OSCAR-13's launch. Further RUDAK testing in late October began to show results. Certain commands and software upload sequences worked after more than a year of failure. While this is progress, it is still uncertain if the experiment will become fully operational. Experiments by the RUDAK team in Munich will continue.

The on-board computer crash of OSCAR 13 and the demise of U-O-9 remind us that amateur satellites are a limited resource. Batteries fail. Solar panel output declines with age. Radiation damages memory circuits, and orbits decay. The best time to prepare for satellite operation is NOW. Those who wait for the ultimate geostationary hamsat will miss years of exciting operation via the current fleet of spacecraft.

RUDAK 2 Goes to the Soviet Union

Scheduled for launch in early 1990, RS-14 from the Soviet Union will carry the latest and most advanced version of the RUDAK digital communications system into orbit. Through connections to the Soviet amateur satellite program via Leo Labutin UA3CR, shown in Photo B (courtesy W6ATC), the West Germans have constructed a RUDAK system on four circuit boards to be mounted in the RS-14 spaceframe.

Uplink frequencies include 435.005, 435.050, 435.190, and 435.150 MHz. The common downlink will be 145.990 MHz. While details of the system are not yet available, it is known that uplink baud rates will range from 1200 to 9600 bits per second, using AFSK (audio frequency shift keying) on FM and other modes.

The 70 cm uplink and 2 meter downlink frequencies define a Mode B system. The analog transponder also on board RS-14 is expected to be at least 90 kHz wide with a similar uplink/downlink configuration to that of RUDAK 2.

From left to right: Valery UA3FH, Eugeny Labutin RA3APR, Leo Labutin UA3CR, and Nick UA3AIC.

Number 30 on your Feedback card

Special Events

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the June issue, we should receive it by March 31. Provide a clear, concise summary of the essential details about your Special Event.

DEC 31, 1989

SOUTH BEND IN A Hamfest Swap & Shop will be held on Sunday, December 31, 1981, at Century Center, downtown on US 33 one-way between the Trustcorp Bank Building and the river. Tables: $5/5-ft. Round: $15/8x2.5-ft. Rectangular: $20/8-ft. Wall locations. Talk-in frequencies: 52–52, 99–39, 69–09, 34–94, 145.29. For more information, contact *Wayne Werts K9IXU, 1889 Riverside Drive, South Bend IN 46616 or call (219) 233-5307.*

JAN 7 & JAN 13, 1990

RIO de JANEIRO, BRAZIL The 1990 Hunting Lions in the Air Contest is a worldwide project sponsored by the International Association of Lions Clubs and Coordinated by the Rio de Janeiro Arpoador Lions Club of Brazil to promote international relations between individuals. Nonlions are welcome to join. For complete rules, write *CONTEST COMMITTEE—HUNTING LIONS IN THE AIR, Rio de Janeiro Arpoador Lions Club, PO Box 2155, Rio de Janeiro 20011, RJ., BRAZIL, South America.*

JAN 13, FEB 24

APPLETON WI The Fox Cities ARC Winter Banquet will be at the Roosevelt Jr. High School at 8 PM on the 13th.

The Club will sponsor HAMFEST 1990 at Sabre Lanes, Menasha, on Feb. 24th. Contact *Don Baker NB9J, 621 W.7th St., Kaukauna WI 54130. (414) 766-3886*

JANUARY 17

PHILADELPHIA PA N3KZ, the University of Pennsylvania ARC will operate on the above date from 1600–2000 in celebration of Benjamin Franklin's birthday and the 250th year of the university, which was founded by Franklin. 14.250 MHz. For commemorative QSL, send #10 SASE to *W3KRB, 1207 Waverly Road, Gladwyne PA 19035.*

JAN 21

SOUTHFIELO MI The Southfield High School ARC is sponsoring their 24th Annual Swap & Shop at the Southfield High School. Doors open at 6 AM for exhibitors. Open to the public at 8 AM to 3 PM. Admission, $4. Children 12 and under, free. $12 for one 8-ft. table, paid in advance. 350 tables. This is Michigan's largest Swap & Shop. Parking, door prizes. All profits will support Electronic Scholarships and Southfield's High School ARC. Contact *Robert Younker, Southfield Senior High School, 24675 Lahser Road, Southfield MI 48034. (313) 746-8675.*

JAN 27

ST. LOUIS MO The St. Louis Repeater Club will sponser the "Winterfest" at the Stratford House just west of Interstate 270, on Interstate 44. Free parking. Admission $1 per adult, children under 12 free. Features include over 6000 square feet of indoor flea market; VE exams; refreshments. 8-ft. tables, $5 each. Advance reservations required. Talk-in on 146.31/.91. For more information, call *James Berger WA0FOK at (314) 351-7732.*

JAN 31–FEB 4

HOUGHTON MI Michigan Technological University ARA (MTU-ARC) will operate W8YY on the above dates to celebrate the university's Winter Carnival. Suggested frequencies: CW—1.805, 3.550, 7.050, 14.050, 21.050; phone—1.850, 3.875, 7.250, 14.250, 21.375, 28.450; packet—145.01. Alumni especially encouraged to call. For certificate, send QSL and large SASE to *W8YY Amateur Radio Club, Wadsworth Hall, Houghton MI 49931.*

Number 27 on your Feedback card

Letters

From the Hamshack

SF Earthquake

Less than an hour and a half after the San Francisco earthquake, I was listening on the amateur radio bands and I was very impressed by the rapid response from my fellow radio amateurs. There must have been at least thirty or forty controllers on various frequencies handling traffic, answering questions as well as they could, and taking phone numbers to try to alleviate anxiety. Most of the queries were from nonhams who had managed to get in touch with an amateur in their vicinity. As an ex-Naval and civilian radio officer, I was very impressed with the order the controllers managed to impart, and the adherence to emergency procedure.

It's a good thing to know who your neighborhood ham is. I hope the media took the time to listen on the 15 and 20 meter bands that Tuesday night. It was incredible. Hams were active and working so quickly I venture to say they were better organized than the professional services. Thank you to all my fellow hams.

Reg Baldock VE7ABF
Clearbrook BC Canada

"Even before the shaking stopped, ham radio operators were establishing communication links with the San Francisco area. Hundreds of volunteers, many staying up all night, pinpointed and communicated information about need for emergency services, damage reports, and handled health and welfare inquiries to and from the area.

"The major ham radio FM communication link between Northern and Southern California is the Condor system of several linked repeaters. This system, built entirely by hams at their own expense, is very reliable . . . it handled continuous high-quality emergency communications throughout the nights and days following the San Francisco earthquake. It did the same after the Whittier quake.

"Condor uses the lower end of the 220 MHz ham band to connect its repeaters. Under very suspicious and unusual circumstances, the FCC recently ruled that the use of this spectrum of frequency (220-222 MHz) will be taken away from the hams and made available to commercial business interests. The loss will be a major one to the brilliant and dedicated hobbyists who built the system, but it will be an even greater loss to the citizens of California when the next disaster strikes."

Alan Ginsburg
Seal Beach CA

[reprinted from the *L.A. Times*]

When the news media turns to ham radio for coverage of a natural disaster, hams have a golden opportunity to show off their preparedness. But the irresponsible ham can also wipe out this opportunity.

During the San Francisco earthquake, we had everyone from national TV to the local cable network and the newspapers looking over our shoulders at my Costa Mesa station, picking up the unique capabilities of hams to stay on the air after "the big one." But all this good PR was wiped out by a ham letting his frustrations out on the air about the jammers and tuner-uppers. It's irresponsible to air our dirty laundry!

Unquestionably, we'll always have those who make life rough for us as we're handling emergency communications or showing off ham radio to the news media. If we give in to these lids, we give ham radio a black eye and these disruptive operators the spotlight they're looking for.

When the cameras are running and the tape is rolling, I don't let them catch on that a tuner-upper or jammer has clouded up the emergency communications. I either QSY or calmly talk over the QRM, and everything sounds great to the news media. We portray most ham radio communications as they really take place on the airwaves.

When the news bureau calls and wants to visit your shack, show them the best of ham radio. Figure out a way to quietly air your frustrations about the occasional lid that may not understand that a steady carrier could very well cost a life. Let the news media see ham radio the way it usually is when it comes to life-saving and public service communications.

Gordon West WB6NOA
Cosa Mesa CA

73 INTERNATIONAL

Number 31 on your Feedback card

edited by C.C.C.

Notes from FN42

HUGO! *Even though you will be reading this several months after Hurricane Hugo devastated many islands in the Caribbean, ham radio operators are still providing communications services for the health and welfare of those islands.*

What makes people give up their free time to spend hours, days, and months at the radio helping others? For those of you helping your fellow man regardless of race, color, or creed, I salute you. Keep up the good work!

Roundup

Brazil From Felipe PY2VRX and Sergio PY2NTD comes a list of new amateur radio beacons. The three beacon callsigns and addresses are: PY2AMI, Box 31, ZC 13.470, Americana, Sao Paulo, Brazil; PT8AA, Box 149, ZC 69.900, Rio Branco, Acre, Brazil; PT7ACC, Box 975, ZC 60.000, Fortaleza, Ceara, Brazil. [*Look for the frequency listings on the 73 BBS (603-525-4438, 8-N-1).—CCC*]

Japan From the *JARL News*: HAM FAIR '89, a three-day festival sponsored by JARL last August, was considered a huge success again. HAM FAIR is recognized as the largest amateur radio event in the world.

Frank L. Striegl 7J1AAL was at the IARU Region 3 meeting and dinner in late August as a representative of the Tokyo International ARA. Frank reports that two Deputy Secretaries General of the Chinese Radio Sports Association, also present, had recently received their (first) INDIVIDUAL callsigns. This is a big step in China, where there are only some 37 CLUB stations. The individuals are Mr. Cheng Ping BZ1CP and Mr. Wang Xun BZ1WX.

Liberia H. Walcott Benjamin EL2BA, IARU Liaison Officer for the Liberia RAA, announces there are three new counties in Liberia, making the total thirteen. They have modified their "Work All Liberia Award" Rules and Map of Liberia. Contact the Liberia Radio Amateur Association, PO Box 987, Monrovia, Liberia.

[*Liberia now lists six awards in their program. Details on the 73 BBS.—CCC*]

South Africa From the *SARL Bulletin* compiled by ZS6AKV and ZS1VP, and submitted by ZS6ET, comes the announcement that Leroy Dale ZS6XJ has received five separate Worked All Britain Awards Group (WABAG) awards for contacts on the 6 metre band. As the first South African to claim one of their awards, the Oxford Group also awarded ZS6XJ a certificate in recognition of outstanding services to the WABAG.

New Zealand From Radio Sweden. DX MEETING–A convention of SWLs and DXers will be held near Auckland, New Zealand, during the Easter Holiday weekend April 13 to 16, 1990. The local branch of the N.Z. Radio DX League will host the convention at a beautiful coastal location 60 kilometers north of Auckland. 1990 is a special year for New Zealand, with celebrations including 200 years of European settlement and 150 years of nationhood. You can write Douglas Doull, Box 3011, Auckland, New Zealand for further information.

AUSTRALIA

Ken Gott VK3AJU
38A Lansdowne Road
St. Kilda, Vic. 3183
Australia

Our Department of Transportation and Communications (DOTC) has announced that the amateur service is now the primary service on two of the WARC bands, 18.068–18.168 MHz and 24.890–24.990 MHz. Previously we could operate on these bands, provided we avoided certain spot frequencies.

The DOTC has also eased restrictions on amateur use of the lower half of the 50–54 MHz band. Although most of the transmissions of a government TV service on this band have been shifted to other spectra, its residual operations on VHF have caused severe restrictions on amateur use of, specifically, the 50–52 MHz section.

Government regulations in VK allow amateurs to have multiple callsigns. A recent WIA check of its records revealed one amateur who holds eight separate licenced callsigns.

[*And some USA hams just want one extra callsign.—CCC*]

Due to miscalculation, results from the VK contest Championship for 1988 have been revised: VK5QX and VK3AJU were equal winners, each getting a duly inscribed plaque.

Photo A. L-R, Claudio PY1DFF/CEØ, Sergio CEØICD, Rosa Roja CEØMTY, unknown.

BRAZIL

Carlos Vianna Carneiro PY1CC
Rua Alfonso Pena, 49/701
Rio - R.J. - Brazil
CEP 20270

JUAN FERNANDEZ ISLANDS PY1DFF/CEØ

It took almost one year for Claudio R.S. Pinto PY1DFF to set up an operation from Chilean Juan Fernandez Islands. A strong mood for adventures, plenty of fair play, CWP Coordinator (Petropolis CW Group) and a deep radio amateur spirit, this is our Claudio PY1DFF/CEØ DX-peditioner.

Juan Fernandez Islands, 350 miles off Chile's coast, in the South Pacific Ocean, was always both a dream and a challenge to Claudio, who named 1988 as Juan Fernandez DX-pedition year, helped by complete and precious information from Pagianotti-is friend CE3DEK, in Chile.

Landing at Santiago de Chile November 30, and then flying to Juan Fernandez Airport December 2, brought Claudio to Robinson Crusoe Island aboard a small Cessna plane. Only very skillful pilots are allowed to do these flights.

San Juan Bautista village, Claudio's operating site, was a four km walk down mountains and a near three hour trip across Del Padre Bay.

Calendar for January

1—New Year's Day, USA; Independence Day, Haiti, Sudan
2—New Year's Holiday, Scotland; St. Berchtold's Day, Switzerland
4—Independence Day, Burma; Martyrs' Day, Zaire
6—Feast of the Epiphany
7—Ethiopian Xmas, Ethiopia, Egypt
9—Martyrs' Day, Panama
10—Yukichi Fukuzawa, 1835
11—Anniversary Day, Albania
12—Mosweshwe, 1785; Revolution Day, Tanzania
13—Pongal Sankranti, Hindu
14—Albert Schweizer
15—Adult's Day, Japan; Dr. Martin Luther King, Jr.'s Birthday, USA
17—Benjamin Franklin, 1706; Anton Chekov, 1860
18—Revolution Day, Tunisia
19—Paul Cezanne, 1839; Archbishop Makarios Name Day, Cyprus; Epiphany, Julian Calendar
20—National Heroes Day, Guineau-Bissau
21—Our Lady of Altagricia, Dominican Republic; Death of Lenin, USSR
22—National Holiday, Australia
23—Hideki Yukawa, 1907
24—Economic Liberation Day, Togo
26—Anniversary of the Proclamation of the Republic, India
27—Wolfgang Amadeus Mozart, 1756; Lewis Carroll, 1832; Franz Kafka, 1883; Chinese New Year Tet (Vietnamese)
28—Jose Marti, Cuba
29—Martyrs' Day, Nepal
30—Franklin D. Roosevelt, 1882; Vasanta Pachami, Hindu
31—Independence Day, Nauru

Number 35 on your Feedback card

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS. (1200 baud, 8 data bits, no parity, 1 stop bit, (603) 525-4438). Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters l or i, or even the number 7. Thank you for your cooperation.

I'm looking for information on the Radio Shack TRC 451. Need all the help I can get. Thank you. *John H. White KB6LJL, 1305 W. Fir Ave., Oxnard CA 93033.*

I need an operating manual and schematic for a Dentron GLA 1000B Amplifier. I will pay copying costs, copy and return the original. Thank you. *Hal Schwelkart WB3JDP, 753 Yeadon Ave., Yeadon PA 19050.*

I built the synthesized 2m transmitter that appeared in the September 1980 issue of *QST* and in the 1986 *ARRL Handbook*. All parts are working except the VCO. Can anyone show me how to properly construct this 144 MHz VCO? I'm also looking for manuals for a Knight 6m transceiver, Model #TR-106. Help! *Duane Isaacson, ARS N0KMX, RR #1 Box 88-A, Iowa City, IA 52240.*

Fifteen Novices have recently graduated from Amateur Radio School at Louisiana State University in Shreveport, Louisiana! We need equipment now—new and used. *Bill and Dee Dee, Route 3, Box 704, Ringgold LA 71068. (318) 894-9224.*

I need a WACOM DUP 641 or 642 duplexer. Would greatly appreciate any information. *Dick Ber KB5BBU, 9617 Vista View Dr., Austin TX 78750.*

Wanted: Any information about WWV Receiver from Specific Products, Los Angeles CA. Will pay. *Orlo Hudson W5LVA, PO Box 968, New Strawn KS 66839.*

I have a circuit board and some parts for an alarm system marked "WD5HSN." I'm looking for a schematic and parts list. I'm also looking for a supplier of Calcutta bamboo poles for my quad antenna. *Judson White WA2PMH, 50 N. Greenwood Ave., Hopewell NJ 08525.*

Need manual for Semitron Transistor Tester and Set Analyzer, Model 1000. Will pay reasonable copying costs. Thank you. *Jack H. Christilaw KO8I, 38700 Ann Arbor Trail, Livonia MI 48150.*

Need schematic diagram for Ten-Tec Model 262G power supply. Will pay copying and postage costs. Also need source for service manual for a Santec Model HT-1200 2m HT. Thanks. *Scott A. Littfin N0EDV, 28579 County Road H., Webster WI 54893.*

Wanted: An operating or service manual for Yaesu FT-224. Will pay copying/postage costs. Also looking for memory expansion board for Tandy 1000A. *Edward Moiser N8IOV, 4376 Coolidge Rd., Coleman MI 48618.*

Schematic and service manual wanted for Pace Communicator II 2m FM transceiver. Will pay copying and postage. Thank you. *Jack Cox KA4OTB, 324 Bunker Hill Rd., Belleville IL 62221-5766. (618) 233-9048.*

Has anyone converted a Kenwood TK-200 to 2m? Contact *Q.R. Galbraith, 4303 Kingsway, Farmington NM 87401.*

I'm interested in what I think is called a Super Radio just for AM reception. *John Crowell, Star Hill Rd., Remsen NY 13438.*

I need a schematic and service manual for a Galaxy III transceiver built in 1964 by World Radio of Iowa. Pay for copy or copy and return. Thank you. *James Crawford NY5Y, PO Box 643, Lovington NM 88260.*

Wanted: Manual and schematic for Azden PCS 5000 2m FM mobile transceiver. Will pay copying, postage. *Keith Frankland KB0CNE, 711 Bellevue Blvd. N., Bellevue NE 68005.*

Wanted: Vidtex Communications Program for Radio Shack Model 4 computer. Will pay costs. *Bill Nelson N2GGO, 52 Dykes Park Road, Nanuet NY 10954.*

Wanted: Operating manual and any info for the Realistic DX-160 SW receiver. Will pay costs. Write first. *James G. Malta N2HOQ, 5263 Deborah Drive, Piscataway NJ 08854.*

Need schematic for a AccuKeyer memory board or kit. Also need a schematic for a Hayes Smartmodem 1200B. Will pay costs. *Arthur Haug WA3ZMH, RD#3 Box 413B, Coopersburg PA 18036*

I'm in search of a substitute or replacement IC-1 for the PLL board in an ICOM 22S. Part number is TC5080P and it appears to be a divider. Scrap PLL units welcome. Will pay costs. *Craig Newman KA1XB, RD #2 Box 109A, Jericho VT 05465.*

Wanted: Manual and/or schematic for AMECO Model TX-86 transmitter. Will pay costs. *Chuck Caruso, 10432 Manzanillo NE, Albuquerque NM 87111.*

Is there a company making kits for HF, all-mode SSB transceivers, and also VHF and UHF, even if crystal-controlled? Is VHF 2m and 220 MHz still available from Hamtronics? Thank you. *Mr. Vinson T. Ngo, 1111 Aguilar St., Cor., C M. Recto Ave., Gocheco Bldg., R-320, Tondo, Manila, Philippines.*

Photo B. Rod Hallen 5Z4BH/KB7NK, Nairobi, Kenya.

Single dipoles for 10/15/20/40 and 80 meters were raised, together with a multiband. The first call, in spite of extremely bad conditions, caused a heavy pile-up, splashing for 10 kHz each side of the calling frequency. About 4,500 QSOs with 88 countries and 5 continents rewarded our efforts on this marvelous DX-pedition.

Electric power was available only 8 hours a day, so batteries helped furnish some two extra operating hours at night. There was very heavy QRN due to the dampness and rainy weather. Daytime conditions were extremely bad during the operation from Robinson Crusoe Island in the Juan Fernandez Islands from 3–10 December 1988. Close to 300 Brazilian stations were QSOed, a fine result! The place is beautiful as paradise must be, glorious nature all around, weather prediction and lobster fishing being the main activities, together with a responsible ecological defense of all animal and nature's species, rainbow colored flowers anywhere by.

Claudio thanks all for the brotherly reception from Chilean radio amateur friends from CE3AA Radio Club, from CE0CRC local Robinson Crusoe's members. A very special "HELLO!" to Sergio CE0ICD and Rosa Rojas CE0MTY at that unforgettable San Juan Bautista village on Robinson Crusoe Island.

A former volcano island, Juan Fernandez Islands were named after the Spanish captain who discovered them in 1574.

All base support for this expedition was given by Petropolis CW Group, by Rob PY1ROB, Baroni PY1HBS, and Claudia PY1TCV. Any information needed, write: CWP, PO Box 90415, Petropolis—R.J.—Brazil, CEP 25621.

Photo C. Extra ops that keep 5Z4BH's operation purrfect.

KENYA

Rod Hallen 5Z4BH
Box 55
APO New York 09675

Many exciting events have happened since the last time I wrote. First, Dick Baldwin W1RU, the newly re-elected President of the IARU, spoke at our monthly meeting of the Radio Society of Kenya (RSK). We took him out to eat at Nairobi's Carnivore Restaurant, which must be the world's largest Bar-B-Que. Every kind of meat imaginable is sliced from the spit right at your table onto a red hot iron platter. Besides more usual meat, there are usually exotic selections. On this occasion we had hartebeest and ostrich.

Dick gave a course to the senior officials of Kenya's Post and Telecommunications Corporation responsible for Amateur Radio Licensing. This course takes the regulations of the International Telecommunications Union and helps to apply them to domestic communications requirements. Of course, if it also stresses the advantages of Amateur Radio to the government at the same time, that's all right, too.

Dick feels the officials were quite receptive. The RSK hopes for a Novice-type license to encourage Kenyan nationals to become hams. He strongly suggested that the RSK initiate a training program for would-be hams.

I have traveled to 5R8, 3B8, S79, 5H3, T5 and 9X5 recently. I operated from the QTH of Tom 5H3TW and Jon 9X5AA. I also had an eyeball QSO with Roul 5H3RB in Dar es Salaam and Dick S79D in the Seychelles.

I'm enjoying RTTY very much and made more than 1300 contacts in 1989, mostly on 10 and 15 meters, my favorite bands. I finished first for Kenya in the ARRL RTTY Roundup in January '89. I also entered the SARTG RTTY Contest and think I did fairly well.

I travel a great deal, but when I'm home stateside hams can usually find me around 21.090 MHz between 1800 and 2100Z. Props are almost always very good to the states at that time. Long path conditions on 20 meters to the Western and Central US have been great around 1300 to 1400Z.

I've had many requests for 40 and 80 meter contacts. I live in a townhouse and the antenna for those bands is a G5RV inverted-V with the peak about 12 meters above the ground just below my Cushcraft A3. I've made many contacts with Europe, Asia, Africa and Australia on 40 meters. The SWR is high enough on 40 meters to cause my TS-430S to cut its power output to about 30 watts, but I still manage to get through. The SWR is way too high on 80 meters, and I don't have an antenna tuner to correct the match. I did make contact with Carlos TI2KD recently for my first North American 40 meter contact.

That's all from Kenya for now. 73 & 88.

Photo D. UPXA USSR Prefixes Award from the West Siberia DX Club, sent by Gennady Kolmakov UA9MA. These awards are 8½" x 12" in size, very suitable for framing.

Number 32 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 Chateau Circle
Payson AZ 85541

From Bad to Better

HF band conditions are expected to be generally disturbed for the first half of the month with poor conditions concentrated between about the 4th and the 14th. Atmospheric and geological upsets could occur in this period as well.

On a day-by-day basis, anything can happen.

Gradually, things will improve from about the 15th toward the end of the month, with good propagation worldwide.

Although propagation this month is not generally as good as it is in the spring and fall months, the peak of the sunspot Cycle 22 is rapidly approaching, and solar flux levels will be very high. Because of this, ionospheric disturbances may be sudden and frequent. Your best guide will be WWV at 18 minutes after each hour. Over-ionization can occur on many days, causing signal absorption on the higher-frequency bands.

Because of the low noise levels in the northern hemisphere's winter, the 160, 80, and 40 meter bands will be quite active during the hours of darkness, and many DX records could fall, as long as magnetic field activity is quiet.

While bands above 20 meters will close shortly before or after dark, the bands below 20 will begin to "shine." During many *days* of the month, you can make some rare contacts on the bands between 30 and 6 meters. ■

EASTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	–		–	–	20	20	15	15	–	–	15
ARGENTINA	15	15	15	20/40	20/40	–	–	–	–	–	10	10
AUSTRALIA	15	15	–	–	20	[illegible]	20	20	–	–	–	–
CANAL ZONE	15	20	[illegible]	[illegible]	[illegible]	20	20	20	15	15	10	10
ENGLAND	40	40	[illegible]	[illegible]	[illegible]	–		10	10	15	20	40
HAWAII	15	15	20	–	40			–	–		–	15
INDIA	15	20		–	20			–	–		–	–
JAPAN	15			–	–	20	20	15	15		–	15
MEXICO	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
PHILIPPINES	20*	–	–	–	–	–	15	–	–	15	15	–
PUERTO RICO	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
SOUTH AFRICA	–	40	–	20	20	–	–	15	15	15	–	–
U.S.S.R.	–	–		–	–	–	20	15	20	20		–
WEST COAST	15	20	[illegible]	[illegible]	[illegible]	[illegible]	80	20	10	10	10	10

CENTRAL UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	15	–	–	–	40	20	20	20	–	–	–
ARGENTINA	10	15	20/40	20/40	–	–		–	–		15	10
AUSTRALIA	15	15	16	20	20/40	20/40	20	20	–	–	15	–
CANAL ZONE	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
ENGLAND	–	–	–	–	–	–	20	15	10	15	20	–
HAWAII	15	15	15	20	[illegible]	[illegible]	–	–	20	–	–	15
INDIA	15	20*	20	20	–	–	–	–	–	–	–	–
JAPAN	15	15	–	–	–	40	20	20	20	–	–	–
MEXICO	15	20	[illegible]	[illegible]	[illegible]	20	20	20	15	10	10	10
PHILIPPINES	15		20	20	–	–	20	20	15	15	–	–
PUERTO RICO	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
SOUTH AFRICA	–	–	40	20	–	–	–	–	15	20	–	–
U.S.S.R.	–	–	–	–	–	–	–	–	–	20	20	–

WESTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	–	–	20	20	20	[illegible]	–	20	15	–	15
ARGENTINA	10	15	15	15	20	–	20	20	–	–	–	10
AUSTRALIA	10	10	15	15	20	20	[illegible]	20	20	–	–	–
CANAL ZONE	15	15	[illegible]	[illegible]	[illegible]	20		15	–	–	10	10
ENGLAND	–	–	–	–	–	–	–	–	20	15	20	–
HAWAII	10	15	15	20	20/40	[illegible]	20	20	–	–	15	10
INDIA	–	–	15	–	–	–		20	–	15	–	–
JAPAN	15			20	20	20	20/40	–	20	15	–	15
MEXICO	15	15	[illegible]	[illegible]	[illegible]	20	–	15	–	–	10	10
PHILIPPINES	–	–	–	–	20	20	20	20*	15	15		–
PUERTO RICO	15	15	[illegible]	[illegible]	[illegible]	20	–	15	–	–	10	10
SOUTH AFRICA	–			20	20		–	–	20	15	–	–
U.S.S.R.	–	–	–	–	–	–	–	20	20*	20	–	–
EAST COAST	15	20	[illegible]	[illegible]	[illegible]	[illegible]	80	20	10	10	10	10

JANUARY 1990

SUN	MON	TUE	WED	THU	FRI	SAT
	1 F-P	2 P	3 P	4 P	5 P-F	6 F-P
7 P	8 P-F	9 P	10 P	11 P	12 P-F	13 P-F
14 P-F	15 F-G	16 G	17 G-F	18 G	19 G	20 G
21 G	22 G	23 G-F	24 G-F	25 G	26 G	27 G-F
28 G	29 G	30 G	31 G			

Number 33 on your Feedback card

. . . de K6MH

I don't know why hams do it, knocking themselves out to build and maintain, at their own expense, the most advanced and intricate, really exquisite communications systems. Amazingly sophisticated repeater complexes with multiple inputs and outputs. Wide area nets. And now super high speed packet nodes. Why? Why do it? What's the percentage in it? What makes Sammy run? What makes hams do this?

Now and then, like when I was coming through Dayton a while back, I catch a glimpse of why it might be, just a little piece of a picture, like a haunting scene from a half-remembered dream.

Remember the great monolith that was floating in space in the movie *2001*? It reminds me of that. When this great "thing" was about to unleash its anciently-conceived program, folks got the message: "Something wonderful is about to happen!" That's what the present state of ham radio feels like to me.

There was a glimmering of it when I was a teen-ager. One summer a ham moved in up the street from me and I actually got to go into his shack and talk to California from this little basement in Dayton, Ohio. Immediately, I borrowed a paper-tape code sending machine, practiced unflinchingly for two weeks until FCC exam time over in Columbus and went there and GOT IT! Holy Smoke! I was one of these guys. If you don't know the thrill, well, you just don't know it.

This was something fantastic. But why?

What was it all for? And now, another 40 some years down the line, with dozens more really exquisite communications problems posed and solved by hams, on their own time, at their own expense, why?

Something wonderful is about to happen. Or am I just dreaming?

Dayton Repeater

A prelude to it happened along about midnight on a hilltop in Indiana.

I'd been scanning 2-meter FM on my little Yaesu HT and logged in about 47 different repeaters. Wow! Ham radio heaven! You know the feeling? But still the question, why?

Then on just about the lowest channel I had logged in, I found a net in progress. People were checking in, maybe a dozen, and at the invitation, I popped in with my call and joined the list. Nothing unusual. I wondered in how many other places across America this was happening.

After a few minutes of formalities, the net control op asked for topics.

OK, let's see what comes up. No-code, naturally. High cost of health insurance. It figures. One or two others. I forget what I asked.

Then we got into it, tossing the ball around. I don't remember how, but it started getting really good. This net was really getting off the ground! The feeling of excitement from way back in my teens, a pride of membership in this family of unseen friends, started welling up. Only this time here I am a grown-up, with some ease, some language skills, and voilà! A lot of the mike-fright was gone. Something real easy started happening. Real human beings started talking and listening. What did we talk about? Essentially we talked about just that . . . we talked about what do we talk about, we hams, and why? We talked about talking about what we really care about, instead of QSO by numbers ('73' included).

People started coming out. Some hung back a little, holding on to their security "we" blankets, and their list of standard messages. But it sounded like such fun, more people started jumping in. Hey, these people are really talking! Something ancient, or timeless was in the air, or on the air. People were dropping their armor, tossing off their hats, slipping out of their shoes. It started feeling like a session around a campfire. Passing it on to the next person became like solemnly passing along the "talking stick" in a Native American council. One talks, others listen. I mean, really listen. When you have whole attention like that, you're either going to run and hide, or relax into it and let it draw from you wisdom you didn't know was there . . . not something you knew before, the usual things you find yourself saying, but thoughts you didn't know and hadn't thought before.

Here this was happening on my beloved, beleaguered, sort of nerdy ham radio. Wow! It took me back to a feeling I had in the Upper Ojai Valley at the end of a grueling 3 hours in a sweat lodge, stepping out into cool, clear air, under the stars. A chant built up, and rolled through the night, over and over:

We are an Old People
We are a New People
We are the Same People
Deeper than Before

"OK, guys, fine business on all that talkin' stuff. I don't think there's much I can add to that. Anyway, I gotta run cause the XYL and the harmonic need a ride downtown. 73. See you later. Be lookin' for you on down the log."

. . . de K6MH ■

73 AMATEUR RADIO

International Edition

FEBRUARY 1990
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SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the June issue, we should receive it by March 31. Provide a clear, concise summary of the essential details about your Special Event.

FEB 3

ST. CATHARINES ONT The Niagara Peninsula ARC is holding its 12th Hamfest and Dinner Dance at the C.A.W. Hall. Admission $3, tables $12 commercial and $5 noncommercial. Talk-in 147.24/.84. Write *N.P.A.R.C. Inc., PO Box 692, St. Catharines, Ont. L2R 6Y3, or call (416) 682-4844.* Dinner-dance tickets available only in advance.

FEB 11

MELVILLE NY The Long Island Mobile ARC will sponsor a Hamfest at Electricians Hall from 9 AM-4 PM. No advance tickets, $5 at door. Exhibitors $20 (advance). For more info contact *Neil Hartman WE2V, (516) 462-5549 or Mark Nadel NK2T, (516) 796-2366.*

MANSFIELD OH The Mansfield Mid-Winter Hamfest/Computer Show will be held at the Richland County Fairgrounds. Doors open at 7 AM. Advance tickets $4, $5 at the door. Advance tables $7, $10 at the door. Talk-in, call W8WE on 146.34/.94. Advance ticket/table orders must be received and paid by Feb. 1. For information send SASE to *Dean Wrasse KB8MG, 1094 Beal Road, Mansfield OH 44905* or phone (419)589-2415 after 4 PM EST.

FEB 17

MARLBORO MA The Algonquin ARC is holding its Electronics Flea Market at the Marlboro Middle School Cafeteria from 10 AM-3 PM. Sellers 8 AM. Talk-in: 146.01/.61. Admission $2. Advance tables $10, $12 at the door. Wheelchair accessible. Contact *Ann KA1PON at (508) 481-4988* or write *A.A.R.C., Box 258, Marlboro MA 01752.*

SALEM OR The Salem and Oregon Coast Emergency Repeater Associations will sponsor the 1990 Ham Fair at the Polk County Fairgrounds beginning at 9 AM. Talk-in: 146.26/.86. Write *Salem Repeater Assoc., PO Box 784, Salem OR 97308.*

FEB 17-18

SARASOTA FL The Sarasota Hamfest South Florida Section ARRL Convention Computer Show is being held at the Robarts Arena by the Sarasota ARA from 9 AM-4 PM. (Set-up on Feb 16th. Free parking. RV space. Talk-in: 146.31/.91, 147.90/.30, 449.425/.95. Admission $5 in advance, $7 at the door. Contact *Hadley Carrigan N4ODK, 101 N. Adams Dr., Sarasota FL 34236, (813) 388-2868.*

FEB 24

MILTON VT The Northern Vermont Mid-winter Hamfest Committee is holding its Flea Market/Auction at the Milton High School from 9 AM-3 PM. Admission $2. Free tables. Talk-in: 145.47/-600. Please call *Mitch Stern WB2JSJ at (802) 879-6589, or Tom Taylor N1EXY at (802) 893-4834.*

BROOKSVILLE FL The Hernando County ARA will hold its eighth annual Hamfest at the Hernando County Fairgrounds auditorium. Advance tickets are $3, $4 at the door. For tickets and swap table reservations, send your check and an SASE to *Hernando County ARA, PO Box 34605-1721, Brooksville, FL 34605. For more information call (904) 796-4840 after 6 PM.*

LAPORTE PA The Laporte ARC's Winter Hamfest is *Saturday* at the Laporte Civic Auditorium. Laporte is 50 miles Southeast of Chicago. Talk-in on 146.52 simplex. Forums include the Midwest Microwave Society's construction exhibit and seminar (bring your SHF projects). Donation is $3.50. Advance tables are $3.50, reserve by sending check and SASE to *LPARC, PO Box 30, Laporte IN 46350.*

FEB 25

DEARBORN MI The Livonia ARC will hold its 20th annual LARC Swap 'n Shop from 8 AM-4 PM at Dearborn Civic Center. Free parking. Talk-in: 144.75/5.35 and 52. Reserved 8-foot minimum table space available. For further information send SASE (4x9) to *Neil Coffin WA8GWL, c/o the Livonia ARA, PO Box 2111, Livonia MI 48151.*

CUYAHOGA FALLS OH The Cuyahoga Falls ARC will hold their 36th annual Hamfest at the Akron North High School from 8 AM-3 PM. Handicap accessible. Tickets $3 in advance, $4 at the door. Advance tables $5, $6 at the door. Sellers may bring their own tables. SASE for ticket orders and table reservations. Talk-in: 87/27. Get details from *Bill Sovinsky K8JSL, 2305 24th St., Cuyahoga Falls OH 44223. (216) 923-3830.*

DAVENPORT IA The Davenport ARC will host its 19th annual Hamfest at the Davenport Masonic Temple starting at 8 AM. Talk-in on the VØBXR 146.28/.88 repeater. Advance tickets are $2, $3 at the door. Tables are $7. For info or reservations contact *Dave Johannsen WBØFBP, 2131 Myrtle St., Davenport IA 52804. For ARRL/VEC exam information, contact Al Broendel N9OK, 2712 38th St., Rock Island, IL 61201.*

SPECIAL EVENTS STATIONS

FEB 1-FEB 11

QUEBEC CANADA The Carnaval de Quebec Special Event and Contest is sponsored by the Club Radio Amateur de Quebec Inc., with the Carnaval de Quebec Inc., from 0000Z Feb. 1st to 2100Z Feb. 11th. Open to all amateurs worldwide 80-10 meters (excluding WARC bands). CW contest is on Feb 3 at 0000 Z. Phone contest is Feb. 10. Souvenir plaques will be sent to the first five hams to contact the station three times, each time on a different band in the same mode. Special call Is CY2CQ. To receive special QSL card please send your card and an SASE or with 2 IRCs to: *C.R.A.Q. VE2CQ, CP 2341 Quebec, Que, Canada G1K 7P5* before April 15 1990 midnight.

FEB 2-4

DRY TORTUGAS (IOTA NA-79) WA4DAN and K5MK will operate /4, from 2000Z Feb. 2-1600Z Feb. 4, in the first expedition to this island in over 20 years. Frequencies: Phone—14260 (including the IOTA net, 1300Z Sat. & Sun.), 21260 and 28560; CW—7030, 14030, 21030 and 28030. QSL with SASE/IRCs/return postage to operator's callbook address.

FEB 3-4

MONTPELIER VT The Central Vermont ARC (W1BD) is sponsoring a Vermont QSO Party from 0001Z Feb. 3—2400Z Feb. 4. Frequencies: Phone: 80-15 meters: The first 25 kHz up from General Phone band edge; Novice 10 meter phone portion, 50.110, 144.2. CW: 3540, 3720, 7040, 7120, 14040, 21040, 21140, 28040. RTTY: 3620 and 90 kHz from lower edge of other bands. Send SASE now for official score and log sheets. Send logs/facsimiles, name, address no later than 1 March to *D. Loverin WA1PDN, 50 Liberty Street, Montpelier VT 05602*

FEB 9-18

SAN BENITO TX The San Benito ARC will operate N5COW on SSB, and N5HOG on RTTY to commemorate the 10th anniversary of the Cameron County Fair and Livestock Show. Frequencies: 28.360, 21.350 and 14.335 SSB, and 14.090 RTTY. From 1800 UTC-0100 UTC. For Certificate, send business SASE (folded) 9½ x 11 (unfolded) and QSL card to *San Benito ARC, Brenda V. Ryan—QSL Mgr., PO Box 1382, San Benito TX 78586-1382.*

FEB 12-16

NEW YORK NY School Club roundup (Formerly Operation SEARCH) is sponsored by the Council for the Advancement of Amateur Radio in the New York City Schools, the ARRL and its Hudson Division Education Task Force to foster contacts with and among school radio clubs. Contest period is Monday thru Friday 0800-2000 EST. Operate no more than 24 of the 60 hours. Logs must clearly show on and off times. Off periods must be at least 30 minutes. Send a large SASE or sufficient IRCs for more info and results to *Lew Malchick N2RQ, Brooklyn Technical High School, 29 Fort Greene Place, Brooklyn NY 11217.*

FEB 24-26

PORTLAND ME The Southern Maine Contest Club is sponsoring a Maine QSO Party from 1900Z Feb. 24-0300Z Feb. 26. Exchange: RS(T) and QTH (county for ME stations; state, Province or country for others). Categories: All band QRO 10 meter only 200W limit. Scoring: 1 point for phone QSOs, 2 points for CW QSOs, multiply by number of counties (16 max) or states, Provinces and countries for Maine stations. Frequencies for CW: 50 kHz up. Phone: 3960, 7230, 14280, 21380, 28480, 50130. Awards: Certificates for each category in each ME. county, state and country. Logs and summary sheet should be sent within 30 days of the contest to *SMCC, PO Box 3422, Portland ME 04104.*

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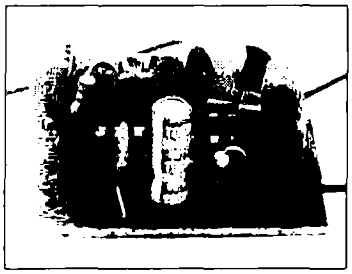

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DEPARTMENTS

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NEVER SAY DIE

Wayne Green W2NSD/1

Beating The Code

It's a shame that the Morse Code is such a bugaboo that its mere specter has been scaring off potential ham newcomers by the tens of thousands. This whole thing is just plain bunk. Learning the code is a snap—if you do it the right way.

Yes, the time-dishonored ARRL system, which most of you probably used, makes the code so difficult to learn that you never forget the weeks or even months of agony it caused. This idiotic and unnecessary anguish has become, in some ossified minds, a right of passage into hamdom. Make 'em suffer, dammit—I had to.

Indeed, our licensing system, which was designed and pushed through the FCC by the League an eon ago, poured the concrete for the system. Five wpm for Novice and Tech, 13 per for General and Advanced and 20 big ones for Extra. From this progression it's obvious that we're supposed to memorize the code, then build our speed up to 5 wpm and then increase it to 13. Then we go on, slowly and painfully increasing, until we finally (whew!) are able to copy 20.

Yes, it actually is possible to do all that. And yes, the process does seem to drive about 90% of our potential hams away. Heck, almost half (43%) of our current licensees seem to have given up even trying to get beyond 5 wpm—making them essentially second class ham citizens. But since when did we Americans ever let the utter failure of our laws discourage us?

The pathetic fact is that learning the code is so easy it's ridiculous. It's been a while since I've written an editorial about this, so you've probably forgotten.

Let's take this whole thing in two steps, since the brain works entirely differently for them. First there's the 5 wpm hurdle. I memorized the code in a few minutes one night while I was getting into my Boy Scout uniform. I'd put it off until the last minute, but I had to know it for the meeting that night. I'll bet I spent 20 minutes—and I've known it ever since.

Of course, it isn't actually necessary to learn the code to pass the Novice or Tech code test. We published a great article in *73* (July 1988) on how to pass the code test without even knowing all the letters, much less being able to copy at 5 wpm. It had to do with merely writing down the dots and dashes, which is easy at that stupid speed. Then you work out the actual letters and numbers from the dots and dashes at your own pace. There's no time limit on the test, you know.

I've heard about a hamfest where they failed everyone who used this system. They're very fortunate that they didn't do that to a litigious person, else they could have been slapped with one heck of an expensive lawsuit. That's when you want to make sure that your club is properly incorporated and has plenty of liability insurance. It's unfair, but no matter who in your club is dumb enough to pull a stunt like that, a litigant will love it and his lawyer will sue the club members with the deepest pockets.

Skip 13, Go For 20

Now, what about the 13 you need for the General Class license? Forget it and go for the 20 right off the bat. I know that sounds crazy, particularly if you've talked with a ham who's spent a year sweating blood to get up to 20 wpm. Once you have a better understanding of how the brain works, it all makes sense.

You see, what happens when you go for your 5 wpm test is that you memorize the code for the alphabet, numbers and punctuation. In computer parlance you set up a lookup table in your mind. Anyone not suffering from Alzheimer's can memorize the forty characters in a few minutes. Then, when you hear a dah-di-die-dit, you think over the list you've memorized and find the letter B. This works just fine until you get up to the clock speed of the brain. Then you find that no matter how hard you try, you can't copy any faster. This is the infamous plateau which hits at around 10 wpm. No matter how hard and long you grind, you can't speed up the brain.

So how can some people copy 80 wpm? Well, they don't do it using a lookup table, that's for sure. No, if you want to copy code faster than 10 wpm you have to start from scratch and train your brain to recognize the sound pattern of each code character at the speed you want to copy and then train your hand to write that character or type it. It's just like learning to type or play an instrument.

If you think about it, you'll see that there is not even a remote parallel between recognizing the pattern for a letter and writing it, and hearing the sound, translating the sound into dots and dashes with one side of your brain, passing that info to the other, where the lookup table is stored, then passing back the info on what letter to write.

There's even more trouble ahead. You're not out of the woods yet. When you train your mind to automatically have you write a letter when you hear a sound pattern, I hope it makes sense that if you vary that sound pattern very much, the mind won't be able to recognize it.

So what we do is use our lookup table system to get through the 5 wpm test. Then we build up our speed until we eventually have to start over and learn it the right way, by sound. That eventually gets us through the 13 per test. Now we move to 14, 15 and gradually up. It's tough going, because we have to relearn the sound patterns for every speed as we increase. This is why it can take months and create a severe trauma.

Smart code teachers start their students out at 20 wpm right from the beginning. Since it's no more difficult to learn code at 20 or even 35 wpm than it is at 13 wpm, why even bother with the slower speed?

How do you do this? You start out with a 20 wpm tape (you'll find one designed for this system in Uncle Wayne's Bookshelf—73T20) and simply listen for a dit. Write down an E. Pretty soon you'll hear every E as it goes by. Now listen for dit-dits and write an I. You'll notice that you'll still be writing the Es too.

Work your way through the alphabet. It's better to start with the more frequently used letters—ETAION SHRDLU. I'll bet you'll be able to tackle the 20 wpm test within a few days this way. Some people don't need more than four or five hours, starting from scratch.

But what about copying code over the air? Don't worry about it—almost everyone today is using a computer to send and receive code. Yes, these are the same codgers who are so adamant about all newcomers passing a code test. I never suggested there were any rational reasons for knowing the code. It's a religious matter.

Once you've taught your brain to copy code at 20 wpm it isn't going to be easy to copy the average key jockey. Your aim was to get your license as easily as possible. Of course, now that you know the code, you may want to start using it and getting your brain so it can decipher it at different speeds.

Frankly, I'd like to see the code test done away with. It's been irrelevant for more than a generation. Yes, I've heard the old saw about the code helping to keep out undesirables. Even a short listen to our bands should expose that concept as ridiculous. We already have the undesirables with us—in large numbers.

If you've read about the wonderful job hams did during the recent hurricane and earthquake, you also know that whole gangs of hams, many of them Extra Class, got together to do everything they could to jam and disrupt the emergency traffic nets.

I happen to think that the code is great for those who enjoy using it. It's easy to learn and fun to use, but it's terribly destructive to the growth of amateur radio.

Japan and No-Code

Opening some unwanted UHF bands for no-coders won't work any better for us than it's done for Canada or Britain, where the concept turned out to be a total flop. The Japanese system, where no-coders are permitted to operate on all ham bands, has helped them achieve far more growth than we have experienced.

Indeed, I'm convinced that the incredible number of new hams the Japanese no-code system has brought into the hobby is the reason why there are so many Japanese engineers and technicians. It's one of the main reasons why Japan has been able to completely clobber America in consumer electronics. And we know that their electronics industry is the very heart of the recent Japanese financial strength—and why they've been able to buy so much of America, like CBS and Rockefeller Center.

No, engineers and technicians aren't everything. We still need to develop some American industrial goals and pursue them. We need to make investment capital easier for entrepreneurs to get through tax law changes. But without engineers, no amount of other finagling is going to do us much good.

Can we convince any youngsters we manage to interest in amateur radio that all they have to do is spend 20 minutes a day for a few days and they'll master the code well enough to pass the 20 wpm test? Not when we have four hundred thousand hams who are totally convinced that the code is a monumental obstacle—painful on the order of childbirth.

Look, I managed to get through using the old progressive speed ARRL system, so I know the misery it causes. I just have never had the sadistic desire

Continued on page 78

QRX . . .

EDITED BY JIM BAIL KA1TGA

Hams Help in Romanian Crisis

Morel **4X1AD** sends thanks from Romania. He is a Romanian-born Israeli ham (ex-**YO4BRR & YO4BE**). He has informed us of the following communications efforts by hams worldwide between December 22 and December 28, 1989:

- In the first 30 hours the single two-way reliable communications system was the 3650 kHz and 14130 kHz nets.
- In the first two days, during the almost total collapse of national and local communications systems, hams handled messages for the Romanian army and for local self-defense groups. (More details to come on this.)
- After December 24 hundreds of hams from Israel delivered thousands of messages from families all over the world to their relatives in Romania (4X1AD himself handled over 600 messages). Unfortunately, propagation to the US was poor during this period so only a few messages were handled to and from the US.
- Many messages were handled for the Red Cross in over 20 countries, including coordination between the convoys of thousands of first-aid vehicles from the rest of Europe and the Romanian army. Hams helped to pre-identify these vehicles and set up army escort for them from the borders.

Many thanks to all the Europeans and DX operators for their important and effective help and for their solidarity with the Romanian people! Many thanks to everyone for not QRMing the net frequencies, and for re-translating when propagation was down. Plus many thanks to YO hams from the near 400,000 Israeli citizens of Romanian origin for their tremendous effort in handling the many thousands of messages from and to their relatives in Romania.

The most important thing is that now all of the YO hams can talk FREELY!

No Amateur License Fees

Amateur license fees have been deleted from the budget reconciliation legislation now under consideration in Congress. The conference committee report states that the conferees recognize that amateur licensees do not operate for profit and can play an important public safety role in time of disaster or emergency. There is little chance of the fees being reintroduced on the floor of either house of Congress.

World Bank Goes on the Air

The World Bank Amateur Radio Club is now on the air. Located at the World Bank headquarters in Washington, DC, it joins the ranks of other world organizations, such as the United Nations, with an amateur radio station. It has been granted a special call sign—4U1WB.

4U1WB operates 80 through 10 meters primarily on weekends and at lunch hour on weekdays. No, it doesn't count as DX, but the QSL card is unique and a shack conversation piece. Send QSL cards with an SASE to: The World Bank Amateur Radio Club, 1818 H Street N.W., Washington, DC 20433.

French 6-Meter Activity

French operators have been active during 50 MHz openings lately, throughout the band. Controversy and rumor have been attached to "theories" of authorization for French stations. Recently, K5ZMS offered an explanation based on his direct contact through the SMIRK organization as well as from information provided by the ARRL.

There are 252 French stations which hold official 50 MHz permits. These stations, located near VHF TV transmitters, are permitted to operate above 50.2 MHz. Their callsigns are unique, in that special prefix letters C, D, and E are added. For example, F1EMT becomes FD1EMT.

Also, 100 VHF Experimental Group licenses have been issued. These operators are not required to hold a permit like the above mentioned group, but some do. The Experimental Group license allows the operator to work in the following frequency windows: 50.086–.089, 50.111–.114, and 50.136–.139 MHz.

For now, to be assured of a legal French QSO, look for stations in the proper areas of the band or ask the station to QSY.

Meteor Scatter Communications

Communication at VHF frequencies using the ionized trails left by meteors is expanding rapidly in commercial and military communications. This same type of communication has been used for many years by radio amateurs. Because the ionized trail lasts only a few seconds, communications during meteor showers are normally carried out with high speed CW or single sideband. But now computers have the ability to compress data and send it in automatic high speed bursts, or packets.

Meteors, many as small as a grain of dust, enter the Earth's atmosphere at speeds of up to 45 miles per second. As the meteor reaches about 50–75 miles in altitude, interaction with the atmosphere leaves a short-lived trail of electrically charged ions. When a radio wave strikes the trail, the ions absorb the energy and radiate it back toward the ground.

A meteor scatter communications system, controlled by high speed computers, transmits a continuous "probe" signal for reflective meteor trails. When found, the transmitter then fires its communications burst and asks for an acknowledgment.

Meteor trails offer a communications link highly resistant to disruption by solar storms, nuclear war, and jamming. This system can act as a substitute for communications satellites, which are more vulnerable. The major disadvantage is that you have to wait for a useful meteor-induced reflector to arise. Although several billion meteors enter the atmosphere every day, relatively few are useful as reflectors between any given pair of ground stations.

A national emergency communications network consisting of meteor burst systems is expected to be completed in the very near future, and will be used by government agencies in the event normal communication links are disrupted by manmade or natural disaster.

Retest as a Penalty?

The FCC has been petitioned to make it possible to force a retest on a violator. There has been no action taken at this time, but the petition seems to have merit. What better way to have a violator learn the rules. (And what a lesson!)

BY7WGL in China

Mainland China's newest amateur radio station took to the air last November 4. Station BY7WGL was opened at Guilin, its first QSO with Beijing's BY1PK, during the opening ceremonies. In attendance was a goodwill mission from the Japan Amateur Radio League, headed by Mr. Yoshito Tanaka JA6VVS. Via JARL.

Don't Resist the Change

A reminder from the National Bureau of Standards: the values for the standard ohm and standard volt are changing. Effective 0001 UTC on January 1, 1990 the standard volt will change 9.2 parts per million while the ohm will be adjusted about 1.7 parts per million.

Why is the NBS is going to all this trouble? First, standardization. Currently, four different standard values for the ohm and volt are used worldwide. After the adjustment next January, the entire world will use the same standards. Second, to correct a mistake. In 1972, the last time the values for the standard ohm and volt were adjusted, the values chosen were wrong.

Famous Broadcaster Bets Ticket

Walter Cronkite, well-known retired broadcaster now living in New York City, has received his Novice Class License. Listen on the bands for KB2GSD. Congratulations, Walter.

TNX to QBX Contributors

TNX to NCARC COMMUNICATOR, B-N-T, State of the Arts, Kettle Drums, and Westlink Report.

Enforcing PRB-1

Work together to override restrictive antenna ordinances.

by Gene B. Williams KA7FQW

We all know the value of amateur radio as a public service, especially in times of emergency. Earthquake, fire, flood—if there is a need for solid and assured communications, hams are there to help. Sometimes it's the only reliable communications available—maybe even the only communications.

A few years ago, the city of Mesa, Arizona, was threatened with flooding that could have knocked out all telephone lines in and around the affected area. The City Manager contacted Bill Falk of the Superstition Amateur Radio Club, and within hours local hams had mobilized to ensure continued communications. The City sent a letter of commendation praising the importance of amateur radio.

Then, on January 19, 1989, the City of Mesa adopted a new ordinance which restricted antenna height to 30 feet, with only one such antenna allowed per lot. This wasn't the first ordinance of its kind, and local restrictions of 30 to 35 feet are becoming common. A few areas have gone so far as to prohibit antennas for radio communications entirely. One, in Lakeside Park, Kentucky, prohibited external antennas for radio communications on the basis of aesthetics. However, the same place allowed external antennas for television reception.

PRB-1

The problem had become so severe that the FCC released PRB-1 (September 1985), a ruling that specifies that federal law takes precedence over local law, and that overly restrictive ordinances are against the public good. [PRB-1 is now incorporated in Part 97.15(E).] The Department of Defense added its own part to PRB-1, saying that such restrictions represent a threat to national security and to emergency preparedness.

The excuse often used by local governments who are familiar with PRB-1 is that it talks about allowances ". . . to accommodate reasonable amateur communications." Although PRB-1 does not specify a minimum height, case precedent and technical expertise prove that the minimum would be 65 feet, and higher in some terrains. Anything below this is automatically a violation of federal statute. Thirty feet might seem reasonable to a local official with little technical knowledge, but from an engineering standpoint it is totally unreasonable by federal statute.

In the past, such restrictions have been fought (and won) on an individual basis. Generally, this requires a great deal of both time and money—something every ham in the area has to face if the tower and antenna exceed the local restrictions.

What happened in Mesa changes all this. When the new ordinance took effect, the Superstition ARC banded together, not to secure variances on an individual basis but to overturn the ordinance entirely.

And they won! The original ordinance was defeated and modified to be more reasonable. This sets a further legal precedent which makes it easier for other communities to declare overly restrictive ordinances illegal. Two cities near Mesa, Glendale and Tempe, are already taking on city hall.

Teamwork, Knowledge, and Coordination

Group action gives strong support for an ordinance overruling. It also reduces the chances of the case ending up in court, and so tends to reduce overall costs.

Your main "weapon" is teamwork. Amateur radio clubs are a natural means of getting together for this purpose. Next, you must know the elements of the ordinance ("ignorance is no excuse"). It's easy to find out about it since it is a matter of public record. You can either buy a copy of the ordinance for a nominal fee, and, in most areas, they'll also be available for study at city hall and the municipal library.

The next step is coordination. Delegate someone in the club or group to take charge of handling correspondence and keeping the membership informed. This person should have experience dealing with red tape, and preferably a degree of written communication skills. Make sure to clearly delineate responsibilities.

No HTs!

Bringing HTs to the town board meeting when you present your case is asking for trouble. If the board or council members get the idea that communications are possible with an HT and rubber duckie, it'll be difficult to convince them that you need a 75-foot tower. Don't expect them to know the difference between local 2 meter communication and long distance HF. If they knew the difference, they would never have allowed the ordinance.

Formal legal assistance is always of value. Superstition ARC was lucky in that a local attorney, Neil Wake KV7O, volunteered his time. If you can do the same, you can greatly reduce costs. Even so, there will be some costs, and taking money from the club funds requires approval of the membership.

Get the ARRL Kit

Your first line of defense is the FCC's PRB-1. You can obtain copies from the FCC in Washington, DC 20554. It was also published in the November 1985 issue of *QST*. Even better, send a 9x12 self-addressed envelope (SASE) with $2.05 in postage attached to the Regulatory Information Branch of the ARRL. Request the PRB-1 kit. This wiil get you not only a copy of PRB-1, but also copies of other ordinances and other related information.

The efforts of the Superstition ARC in Mesa resulted in the "model ordinance," as it is now known. This ordinance reads as follows, concerning communications towers:

a) Such structures shall not be located in the required front yard or in front of the front line of the dwelling or principal building; and

b) such structures shall not exceed a height of 10' within the required side or rear yard; and

c) such structures shall not exceed a height of 75' within the buildable area; and

d) not more than one such structure per lot or parcel shall exceed a height of 30'.

Sample legal cases are always good, especially when dealing with the City Attorney. Therne v. Lakeside Park, Kentucky (case # 83-218, filed 2-24-87) is a classic. Although there is quite a long list, a couple of other good ones are: Williams v. City of Columbia (SC—case #88-2199-15, 2-28-89); Bodony v. Incorporated Village of Sands Point (NY—case # CV 86-3967).

Clippings and letters of commendation which show the public service side of amateur radio, and the importance of effective communications, will also help, especially if they're from a local source. Your club might be helping a local hospital to run test emergencies. The Red Cross recognizes the value of amateur radio, as does the National Guard and Civil Defense. The local MARS chapter is always a valuable source of support.

Use Patience and Reason

Expect resistance. You'll probably be facing the people who came up with the restriction. They didn't enact it out of malice, but out of ignorance of how important amateur communications are, and what's required to support them.

If their attitude seems unreasonable, respond with reason. Prepare to answer—calmly—every objection with sound, solid reason.

For more information, contact Bill Glaze KA7SUF, care of Superstition ARC, PO Box 1551, Apache Junction, AZ. 85217-1551. Please include a self-addressed stamped envelope (SASE) for response.

Gene B. Williams KA7FQW, 19333 E. Ocotillo Rd., Queen Creek AZ 85242.

Contest Quality Headset and Mike

Let your VHF/UHF headset/mike work on HF.

by Keith Stieb VE5XZ

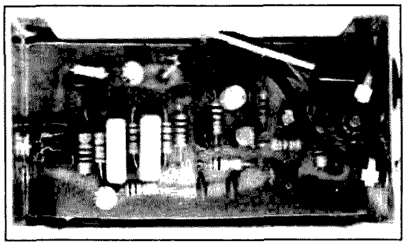

Photo A. Top view of the interface board.

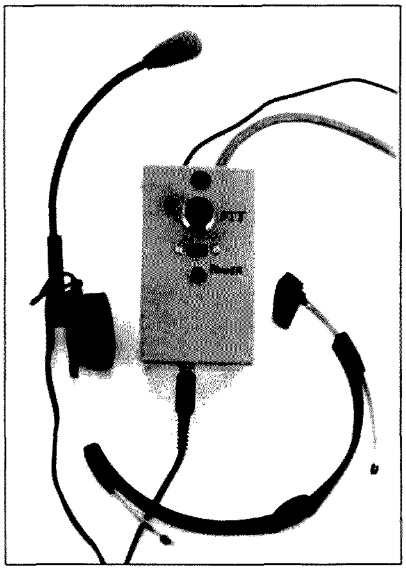

Photo B. The complete VHF/UHF headset to HF rig interface system.

A fellow ham and I were discussing boom microphone/headsets. My friend was considering buying a commercial headset to allow hands-free operation and improve reception (his hearing was a little off). He soon asked, "Why can't I use the headset from my two meter rig?" and I replied, "Why not?" With a few modifications, there was no reason why it shouldn't work! It would also give a dual purpose to the headset, which often just sat on the shelf.

Consequently, we designed an interface and attached it to an HF rig for testing. After a few problems were ironed out, we came up with a very acceptable unit.

Solving the Problems

We first solved the problem of RF getting into the unit by installing liberal RF chokes and bypass capacitors. We thought about putting ferrite beads on each lead, but we didn't try it because the chokes and capacitors solved the problem. We expected the unit to operate at a 2 kW plus level, and it did.

Next, we found, as inherent in electret mikes, that the microphone element responded much too broadly in frequency, especially in that it responds to too low a frequency, down to 25 Hz. This is no problem for VHF FM, but too "bassy" a tone on HF SSB is unacceptable. We designed an audio network and played with it. After some on-the-air testing, we selected a system.

An active filtering system would have been nice, but I opted for a passive system to avoid possible RF problems, such as feedback. (Play with the values of this network and tailor the response for your own preference.)

After the audio shaping network, we added a simple emitter amplifier to increase the audio signal and buffer the passive shaping network from the "loading" effects of the rig. There is NO adjustable gain control (AGC), as the mike gain control on al-

Parts List for Interface

Part	Call Out	RS #	Value	Price ($CDN)
Resistors	R12	271-306	3.3Ω	4.99*
	R9	271-306	470Ω	
	R1	271-306	560Ω	
	R3,4	271-306	2.2kΩ	
	R10	271-306	4.7k	
	R2,5,7	271-306	10k	
	R8	271-306	100k	
	R11	271-306	1k	
(RS 271-306 is an assortment pack)				
Capacitors	C1,7,13,14	272-801*	0.001µF	2.99*
	C5	272-801*	0.002µF	
	C12	272-801*	0.005µF	
	C8, C10	272-801*	0.01µF	
	C6	272-801*	0.05µF	
	C3,4	272-801*	0.33µF	
	C11	272-1024	4.7mF/35V	0.79
	C2,9,15	272-1025	10.0mF/35V	2.67
*Assortment pack				
Transistor	Q1	276-2009	2N2222A	0.89
Inductors	RFC 1,2,3	273-1601*	1.0mH RFC	2.99*
	Ferrite bead (on base of Q1)	273-1601*		
*Assortment pack				
Bare PC board				1.50
Boom mike jack		274-249		1.39
Mike connector		274-025		3.79
¼" phone plug		274-1536		1.50
Aluminum box		270-239		4.79
PCB standoffs		276-195		1.99
9V bat. connector		270-325		0.35
9V bat holder		270-326		0.45
Mike cable				1.00
Audio cable				1.00
Pwr. switch		275-662		3.99
PTT switch		275-8077		1.75
LED w/case		276-068		1.10
9V battery				1.95
Yaesu YH-1 boom mike/headset				20.00

Total cost of project is $62 CDN ($49 US). Those with junk box parts can expect to spend as little as ½ to ⅓ of the above price. If you have any trouble finding parts at Radio Shack, try All Electronics Corporation in Van Nuys, California.

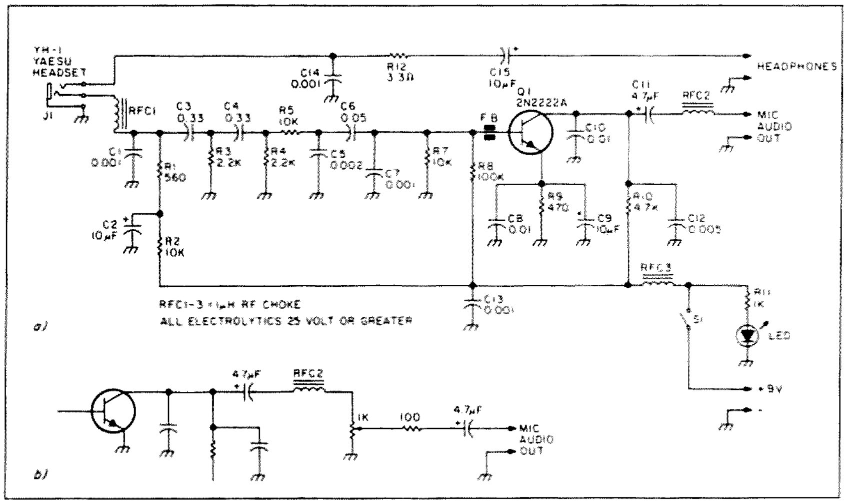

Figure 1. a) is the schematic for the VHF/UHF headset to HF interface unit. b) shows the schematic to install an AGC in the interface.

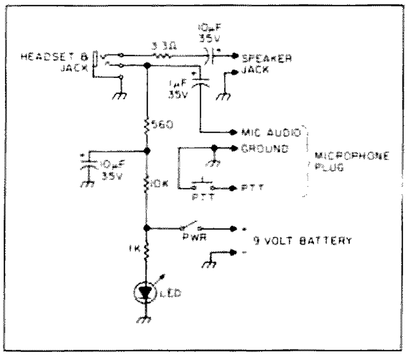

Figure 2. Circuit to use the interface headset with most VHF/UHF rigs.

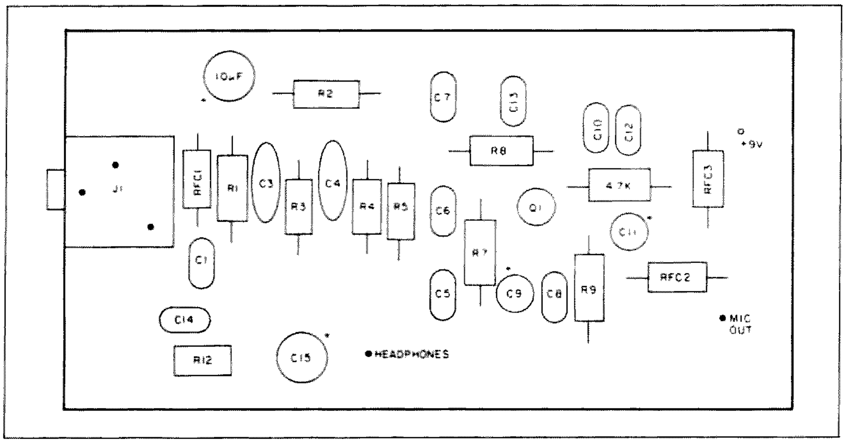

Figure 3. Component layout for the interface.

most all HF rigs does a fine job at this. If you want to install an AGC in your interface unit, see the circuit in Figure 1b. Consider also the input impedance of the microphone circuit on your HF rig when making the circuit. Be sure it doesn't get loaded down as you adjust the interface level.

Interface Circuitry

The interface unit consists of three parts. The first part, R1 and R2, and associated parts, is the circuit that supplies voltage to operate the electret microphone.

The second section, consisting of R3, R4, and R5 with associated parts, is the passive audio network that shapes the audio output of the electret mike element.

The third section is the common emitter amplifier/buffer circuit, built around Q1, a 2N2222A transistor. Output impedance of this unit is approximately 600Ω.

We added a PTT switch as an afterthought. There are times, especially with older rigs, when VOX operation is not advantageous. Depending on the rig, the PTT ground connection can be common to the interface ground or separate from it. Some of the newer rigs require separate grounds.

This unit has been interfaced to a variety of rigs with good results. These rigs include: Heathkit SB-102, Yaesu FT-102, and Kenwood TS-830S, 440S, and 940S. All performed well with the unit.

On-the-air tests were very gratifying. We compared this unit to some popular microphones, and in most instances, we could not criticize the headset/mike.

The YH-1 was designed to operate with only specific Yaesu rigs, one of which I know is the FT-727 dual-band HT. You can, however, use this headset/mike with most VHF/UHF rigs. In fact, I made a small circuit (see Figure 2) and interfaced it to several rigs, including the Yaesu FT-230R mobile and FT-23R HT, and all worked fine.

Easy-to-Find Parts

You can buy most of the parts for this unit at Radio Shack. I found all the capacitors, resistors, and RF chokes in their respective assortment packs. An alternative source of parts is All Electronics Corporation of Van Nuys, California.

The YH-1 headset is available from any Yaesu dealer. However, most of the optional headsets for VHF/UHF rigs use electret microphones. I see no reason why, with a couple of minor modifications to the R1, R2 section, you couldn't use this interface with other makes and models of headsets.

You can spend a few dollars and give your headset dual purpose capability on VHF/UHF, and the HF bands. For us, it was well worth the effort! 73

Keith Stieb VE5XZ, currently a firefighter, has been a ham for 18 years. Keith's previous contribution to our pages is his "Heathkit HF Linear Mods" article in the March '88 issue. He teaches at the local radio club. You may reach him at 358-8th St. East, Prince Albert, Sask., Canada S6V-0W2.

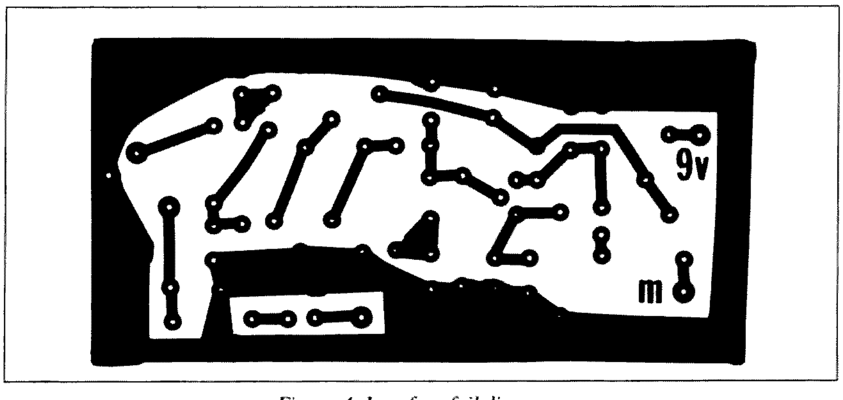

Figure 4. Interface foil diagram.

73 Review

by Larry R. Antonuk WB9RRT

Protel Easytrax

PCB Layout System

Protel Easytrax PCB Layout System
Protel Technology, Inc.
50 Airport Parkway
San Jose CA 95110
Telephone: (408) 437-7771
Price Class: $400

Protel Easytrax is a computerized system for producing camera-ready PC board artwork. Using a library ot "pre-built" designs (DIP IC packages and outlines for resistors, capacitors, and transistors, etc.) and a system for laying down pads, tracks, and holes, this program lets you create multilayered PC board designs and then output them to any of several printers or plotters. To use Protel Easytrax you'll need an IBM compatible with 640K RAM and two floppy drives; I also recommend a hard drive, mouse, and color monitor.

Making Circuit Design Easier

I designed and etched my first printed circuit board in May of 1978. The project was a logic pulser, published in a monthly electronics magazine. The article suggested using perfboard, but I wanted a PC board. The circuit had been designed to fit inside a 35mm film canister—miniboxes were expensive back in those days. The resist method used was the only one available: a 99¢ Radio Shack resist pen (a.k.a. Magic Marker). The results were, shall I say, somewhat marginal. However, with a little solder to bridge a few thin spots on the traces, the thing actually worked. I was amazed.

Things change. The above scenario actually flashed through my mind shortly after I booted up Protel Easytrax. As an introduction to the product, the manual suggests that you call up a DEMO file for practice. The DEMO is a "simple Z80 microcomputer layout". This "simple" layout has 12 ICs, two dozen miscellaneous components, 518 holes, 423 pads, and 1544 segments of track. The time lapse between hitting "return" and the point where the layout was completely drawn was slightly under three seconds (using a '386 laptop, with math coprocessor, running at 12.5 MHz). Want to zoom in on a specific section of the board to erase, rescale, or make a change? Just call down the menu, hit the appropriate command, and wait about a tenth of a second. Things move fast these days.

Easytrax is Protel's low-cost, easy-to-use package, but its capabilities are far from limited. Maximum board size is 32" x 32". Each board may contain up to six signal layers, power and ground layers, and a component overlay. Pad size, track width, and text height are all variable. Entire blocks of the layout can be marked off, and then moved or rotated—existing tracks "stretch" as required. The program serially designates each component as it's placed on the board (U1, U2, etc.) and creates a separate file listing the number of components, their designation, and location. This information can later be converted to a Bill of Materials by using an included utility program.

The most important characteristic of any tool is its ease of use. Protel Easytrax is menu-driven but, as with any tool this complex, you will need to read the manual. The manual contains a step-by-step tutorial that guides the user through the steps of creating and plotting a layout.

> ***"However, for the experimenter who builds even five boards a year, the savings in time will be considerable."***

To get some idea of the "friendliness" of the program I ran a simple benchmark test. First, I went through my files and dug out the schematic of the ol' logic pulser (one 14-pin DIP, six caps, five resistors, and two switches). Totally disregarding the tutorial, I sat down at the keyboard (sound familiar?). With virtually no previous CAD experience to my credit, I began laying out the circuit, looking up information and commands as needed. The first layout took me one hour and twenty minutes. Clearing the screen and starting from scratch, I produced the same layout again in just under twenty minutes. One week later, the same project took eleven minutes. Regardless of the time, the frustration level decreased with each use. Conclusion #1: This is an easy-to-use program. Conclusion #2: You'll save time in the long run if you use the tutorial.

An included separate program called Easyplot lets you print or plot the finished layouts created with Easytrax. Two programs are needed because of the length of time required for complex plots. Once you create a file, you can move it to another computer, run Easyplot, and plot the layout. This way you don't tie up your main computer, allowing you to do more design work. (Easytrax disks are not copy protected, but the program comes with an external program protection device or "key" that plugs into the printer port. The Easytrax portion will run only with the "key"—Easyplot runs without the use of a "key.")

The highest quality plots are produced on plotters or laser printers; the resolution of a dot matrix printout leaves something to be desired. If a dot matrix printer is all that's available, this limitation is easily overcome by changing the scale on the print routine to produce a twice normal size layout. This can then be reduced on a copy machine by fifty percent to greatly increase the finished resolution. Of course, this trick reduces the possible size of the finished board to one-half the size of your dot matrix printer paper, but this should still be sufficient for most hobbyist applications.

Yes, It's Worth the Price!

At first glance, some hams may have trouble justifying $395 for their own copy of Protel Easytrax. However, for the experimenter who builds even five boards a year, the savings in time will be considerable. If that time is spent writing those projects up as magazine articles, the program could easily pay for itself in a few months. Compared to conventional methods, Easytrax is so easy to use that it's worth doing just about anything to get your hands on it.

Ham Economics dictates frugality, so how about getting the ham club to buy a "floating" copy, and have a club member plot the finished files at work? Or maybe you could talk the boss into getting a copy for those occasional projects, and letting you borrow it in between. The options are many, but the bottom line is that once you've used Protel Easytrax you'll never go back to conventional PC board layout methods again. ■

Larry Antonuk WB9RRT has written numerous reviews on test equipment and electronics books. He currently works as a project manager for a land mobile service shop in Keene, New Hampshire. He enjoys home-brew projects, experimentation, and instrumentation. Contact him at P.O. Box 452, Marlborough NH 03455.

Number 7 on your Feedback card

HAM PROFILES

There are no "average" hams!

Ham with a Dramatic Past

Dale Shimp W9LOV earned his amateur radio license in 1940. He joined the New Trier (Illinois) High School Amateur Radio Club and Broadcasting Club. One of his classmates in the Broadcasting Club was Charlton Heston. After graduating in 1941, he briefly attended Northwestern University, took an advanced technological radio course, then went to work for the recording studio that transcribed the very popular radio show of the day: "Bob Elson Aboard the Twentieth Century Limited."

After that he played the young hero on a bloodcurdling radio mystery show on WHIP where he was stabbed, shot, strangled, and always died before the end of the show. He was given the stage name of "Henry Dale." Next, he worked as a sound effects man at the same station until he moved to the Engineering Department of WJWC. There he worked with Clifton Utley and played practical jokes on Mike Wallace.

After a stint in the U.S. Army he came home to a job in the Engineering Department at WLS and stayed for 43 years, the longest term and possibly the oldest employee of that radio station. He is now retired from that job.

Dale is one of the founders of the Bear Repeater group, and he's now its Trustee, Director, and Treasurer. He has been a part-time Sergeant in the Morton Grove Park District Police for 22 years. He's also a photographer, a treasure hunter, and a fisherman. He and his wife Margit have two children and three granddaughters. Incidentally, after he was married, Dale learned that he had been adopted. He was reunited with his two sisters and his brother, who is also a ham! (Biography by Angelo Polvere KA9CSO.)

Another Reason to Check Out the School Net

Mary Alestra KB2IGG is 11 years old and in the seventh grade at Intermediate School 72 in Staten Island, New York. She became interested in ham radio through her friends in Carole (WB2MGP) Perry's "Introduction to Amateur Radio" program at the school.

When she was a sixth grader, Mary would come to the school's hamshack (Does your local school have a hamshack? If not, get working on it!) early in the morning to work with Carole and to get experience listening and speaking on the air. Studying on her own, Mary passed the Novice exam and is now working hard to upgrade. Mary gets on the air every morning, talking to hams on the local repeaters. She has also participated in the "CQ All Schools" net Tuesdays and Thursdays at 17.30 UTC on 28.303 MHz.

Mary loves animals and has many interesting pets, including two gerbils and a snake. She loves to draw and to create cartoon figures. Mary plans to pursue a career in communications. 73

FEEDBACK

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Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

The Great San Francisco Quake '89

Hams fulfill the purpose of the amateur radio service.

by Bill Pasternak WA6ITF

Within minutes of the October 17, 1989 earthquake, hundreds, maybe thousands, of amateur radio operators responded statewide and nationwide. While Pacific Bell Telephone suffered little damage, the lines into and out of San Francisco were jammed. According to a telephone company spokesman on the ABC news, some 25,000,000 callers attempted to reach San Francisco almost instantly. The number of callers continued unabated for three days. For the average citizen trying to find out about his loved ones or friends, there was only amateur radio to turn to.

Thousands of "health and welfare" messages flowed into and out of San Francisco and areas to the south. The hours of preparedness drills paid off for those who devote themselves to emergency communications. Statewide nets responded almost instantly, with long-haul nets close behind.

Digipeating Packeteers

According to Lew Jenkin N6VV, president of the Northern California Packet Radio Association, digital, rather than analog, communications prevailed. "We had it coming in on AMTOR; on packet via HF nets; and it could be easily warehoused in the devastated area, then worked [delivered] at the convenience of the folks there."

Jenkin added that the ability to 'digipeat' by every ham running packet offered many advantages over conventional voice repeaters with traffic on VHF and UHF: "No other mode gave that form of audit trail and trackability. And the adaptive nature of the networks—not having to rely on one repeater—let us switch [work around it] when we lost one of our major nodes down at Crystal Peak; we just brought up additional nodes. We were able to create a new path into areas where we needed to get traffic..."

Digital-Analog Cooperation

One of the long-running bones of contention between digital and analog amateur communications has been the self-imposed isolation between the two. The ARRL has tried to remedy this by asking voice repeater coordinators to take on packet and digipeater coordination, but virtually all have declined. This has led to even further isolation. But in California, this isolation ended when the quake began to rumble.

N6VV seems to feel things have changed: "The combination of the automatic routing capability of packet and the appropriate use of the FM networks...made it work. When we got word [via packet] of emergency relief supplies from Los Angeles, the first thing we did was to get on 2 meters [FM voice] and contact the E.O.C. in Santa Cruz, which passed that traffic on the Loma Prieta machine...Meanwhile, 'health and welfare' traffic was flowing [on packet] all of the time that the [voice] conversation was going on."

But there were some reports of packet-oriented hams being a bit too zealous about proving the importance of their favorite mode at a time when they should only have been worrying about getting messages through. Several apparently showed up at disaster coordination sites armed with radios and TNCs, but no microphones. They insisted that packet was better than voice for 'tactical' amateur radio communications from the streets.

Jenkin thinks this was a pretty bad idea: "...The general reaction up here was that talking keyboard-to-keyboard in an emergency situation was not that effective. There may be some isolated cases where we will see that it worked. But what we did was to try to get some people with portable packet gear into the affected areas to take 'health and welfare' outbound traffic..."

The Lifeline for the City

The quake's epicenter was near the once-picturesque town of Santa Cruz some 50 miles away. Santa Cruz was devastated and cut off. Also hard hit was the city of Hollister. A day after the quake, NBC Network News producer Alan Kaul W6RCL visited the Red Cross Evacuation Center in Hollister with a camera crew for *Nightly News*. Alan and crew came across an amateur radio station that was literally the lifeline for the city. Al was very moved by what he saw, and called *Amateur Radio Newsline* with the following story:

"One of the Red Cross Centers was at the San Andreas High School in Hollister, California, about 30 miles east of the earthquake epicenter. Hollister is the so-called 'earthquake capitol of the world' because it is at the junction of three of California's most active faults—the Caliveras, the Heyward and the San Andreas. Officials here were ready for a quake. They had rehearsed just three months before.

"RACES member Al Romeo N6OJO of San Jose was one of the volunteers who ran the amateur station at the San Andreas School. Forty families whose homes were now unsafe had moved into the shelter. N6OJO, N6RCO, N6DDM and WA6BWT took turns providing coordination. Much of the effort involved keeping the shelter in contact with Red Cross headquarters about fifty miles away near San Jose. They had a packet radio system and were prepared to handle health and welfare messages on HF and VHF radio.

"The amateur radio operation was manned around the clock for about forty hours until power and telephone links were restored. And what type of messages do radio amateurs handle during an emergency like the quake? One order via 2 meter radio in San Francisco was to a drugstore for the purchase of three hundred desperately needed baby bottles."

Alkaline Batteries Last Longer

What did N6OJO learn from his experiences in the quake? Not to rely on NiCd batteries. There was no good way to charge them when the power was off for so many hours. He said that dry-cell, alkaline batteries last much longer, and he suggests that anyone preparing for an emergency stock up on them.

The Condor Connection

Given the 220 MHz controversy, it's ironic that the statewide backbone of amateur radio emergency communication was not HF, but rather the 220 MHz statewide open interlink called the Condor Connection. Designed and built by Mark Gilmore WB6RHQ and the late W6TLG, the Condor Connection covers the state from San Francisco/Sacramento to the US-Mexican border, and east to Arizona and Nevada. This open system functions as a three-state super-repeater with the ability to handle massive amounts of voice traffic free of the kinds of natural and manmade interference often hampering HF links. WB6RHQ had engineered Condor to withstand a quake

Continued on page 83

73 Review

by David K. Pelaez AH2AR/8

Ramsey SA-7 Broadband RF Amplifier

A hot little amplifier at an extremely low price.

Ramsey Electronics
793 Canning Parkway
Victor NY 14564
(716) 924-4560
Price Class: $15.00

The SA-7, new from Ramsey Electronics, is an easy-to-build kit for a general purpose broadband RF amplifier, capable of operating from 100 kHz to 1 GHz. It's small on price, but big on performance.

After searching high and low (no pun intended) for an inexpensive preamp to help boost the front end of a tired shortwave communications receiver, I came across the Ramsey Electronics advertisement announcing several new "mini-kits." The SA-7 preamp kit was inexpensive, so I took the plunge and ordered it. One week and $15.00 later, I received a curiously small parcel from Ramsey.

Assembly

The SA-7 is easy to assemble. There are only 15 components to mount on a phenolic circuit board measuring 1¼" x 1⅝". I put it together in about 15 minutes using just a soldering iron, a steady hand, and about an inch of solder. You won't need to use any tuning or test equipment after completion. Even a first-time kit builder can tackle this project with confidence.

But, even as a "veteran" kit builder, I almost forgot to install the kit's only SMT (surface mount technology) resistor. After assembling and soldering all the components on the PC board, you must solder the SMT resistor between the two designated foil traces on the foil side of the board. Remember also to keep all of the other component leads as short as possible if you want to exploit the amplifier's capabilities on the "high end" of its range. Long component leads may also cause it to break into oscillation.

Amplifier Application

After mounting the SA-7 within an Allied AX-190 receiver, I put in a jumper within the receiver's power supply and borrowed approximately 9 volts to run the newly installed amp. Current drain is minimal (less than 50 mA) and the power requirement for this amp is 8 to 15 volts DC. Since this voltage is available in most solid-state equipment, it's a snap to use the available power already present within the gear. The extra current drain usually won't be noticed. If you opt to use the SA-7 in a tube rig, a 9 volt battery or an outboard power supply would be an alternative solution.

Top view of the assembled Ramsey SA-7 broadband RF amplifier.

After turning on the receiver with the SA-7 in line, I was pleasantly surprised to notice a marked increase in the number of stations on the air. I noted a solid two S Unit jump in signal strength throughout the HF receiver's range. Stations barely audible with the SA-7 out of line came up to "armchair copy" when the amp was put between the antenna and receiver. I noted an increase in the noise floor, but the two-plus S Unit increase in received stations' signal strength more than compensated for the associated and expected increase in the receiver's noise floor. The spec sheet indicated a 3 to 5 dB noise figure.

Technical Information

When preamplifiers are added to a receiver, images and heterodynes may appear, especially if the preamps don't have selective filtering as part of their design. At VHF and UHF frequencies, images can become a real problem when the receiver and antenna are located near crowded RF environments. Some preamps may end up acting like broadband mixers. I didn't notice this with the SA-7, but it could become a problem.

The design of the SA-7 is simple and straightforward, and the addition of helical filters or tuned circuits would totally defeat the idea of keeping this kit under the $15.00 mark. This amplifier contains two stages (with no tuned elements): a common emitter stage which drives an emitter-follower by utilizing two 2SC 2570s. Page 17 of the ARRL publication, *Hints and Kinks for the Radio Amateur*, circa 1975, described a similar circuit design as a "general purpose preamp." This publication stated that a common emitter-follower stage tends to be unstable but, as explained in the *Handbook*, the absence of tuned elements allows for extremely good stability.

Listed specifications claim a gain of 15 dB at 1 to 950 MHz and 8 dB at 1300 MHz. The SA-7 can be used in many applications requiring extra gain in a wide variety of amateur and general coverage receivers. It can also be used to increase the sensitivity of frequency counters. Because of its small size, the SA-7 can be used internally in almost all receivers, or placed in a small chassis, for a variety of applications within the hamshack.

A Good Deal

On a scale of 1 to 10 (*not in dB*), I would give this little broadband RF amp a 10!! Now, I wonder if the SA-7 would work in boosting the horsepower in my Ford Ranger?!? 73

Contact Dave Pelaez AH2AR/8 at 4872 Trailside Court, Huber Heights OH 45424.

73 Review *by Michael Cobuccio WA1EYP*

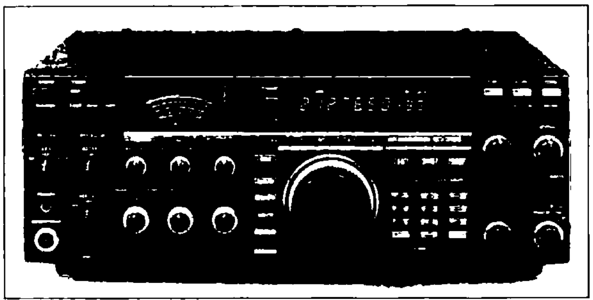
The ICOM IC-765

The DDS unit makes the difference.

ICOM America, Inc.
2380-116th Ave. N.E.
Bellevue WA 98004
Tel. (206) 454-7619
Price Class: $3150

A few months ago, a friend invited me over to see ICOM's new IC-765 all-mode, all-band rig. I was immediately impressed by the receiver's quietness, but I wondered what else was different from its predecessor, the IC-761, to warrant the price increase.

After examining the rig inch by inch, I concluded that the IC-765 is a finished version of the IC-761. It has many desirable features missing from the latter. Right away, I ordered an IC-765 of my own.



The ICOM IC-765, quietly receptive.

The unit I'm reviewing is from the first production run, SN# 0001132. I installed option modules FL-53A and FL-101, FL-102 filters, a CR-282 high stability crystal unit, and the UT-36 voice synthesizer module.

Like the 761, the IC-765 has its own AC power supply, antenna tuner, and general coverage receiver. However, the options available for this rig are the same as those for the IC-781. The IC-765 is like an IC-781 without the scope and second receiver.

Scanning the IC-765

Here, ICOM added a digit to the digital frequency readout for display accuracy. ICOM has also expanded memory capabilities to 100 banks and improved frequency control, including a smoother feel in the variable tuning rate.

ICOM's "band stacking registers" ensure that the micro-processor remembers the last frequency your VFO dial was on before you switched to another band. The IC-765 has an additional register for what appears to be the general coverage band. It doesn't have a HAM/GENE coverage switch. ICOM's CPU unit now recognizes a ham band from a general coverage band, allowing the operator to use its memory more liberally.

Unlike the IC-765's less expensive cousin, the IC-725, you cannot program the main dial frequency step size. To offset that deficiency, ICOM provides a DIP switch under the bottom cover that allows you to select the frequency travel of the main tuning dial to either 5 kHz or 2.5 kHz per revolution. Overall it looks like ICOM has put substantial efforts into improving their frequency control features.

The Dawn of DDS

The IC-765 contains ICOM's newest chip, the DDS, or direct digital synthesizer, a significant contribution to HF design. Though my ear cannot measure any improvement in frequency stability, the receiver's so quiet that when no signals are present I sometimes think the radio is off. This is similar to Ten-Tec's Omni-V. ICOM's published noise floor, a value that measures how much noise or hash the receiver circuits produce, which could interfere with an extremely week incoming signal, is around −140 dB.

What is the difference between the DDS chip and a PLL system? In both cases, the microcomputer in your HF rig periodically loads your rig's frequency control logic with digital data that corresponds to your rig's current frequency. In the PLL system, this data in turn changes the output frequency of the rig's phase-lock loop system which usually serves as the rig's master oscillator system. With a typical "digital" PLL, the output is somewhat squared; the sine wave contains a series of minute steps which together "simulate" a sine wave. These squared waves contain PLL switching noise, the frequency correction switching, and harmonics typical to square waves.

The DDS chip, a kind of digital-to-analog converter, generates as close to a "real" sine wave as possible—NOT a squared, steplike sine wave. The result is the frequency stability of a digital PLL system and the low noise and harmonic content of a traditional oscillator circuit. All of the rig's circuits and low noise components benefit immediately.

On the receiver side, ICOM has added to its general coverage front-end a three-step incoming signal attenuator quite useful on 75 meters in the evening here in New England. The existing preamp on position is on this same knob, of course. The audio tone control has migrated from its larger knob style to a push button, recessed control on the bottom left. In its place is a CW pitch control which I have found quite useful, especially when copying Morse code with multimode data controller equipment like the AEA PK-232. You can vary the audio frequency of a received CW signal without changing the actual VFO frequency. This means you can vary CW tone pitch when using a very narrow CW filter, say 250 Hertz. Ordinarily, varying the VFO frequency would cause you to drop out of its passband and consequently lose the signal.

No More Presets

The antenna tuner no longer has any presets. Hurrah! How I hated adjusting the tuner presets on the IC-761 and an AT-500 I once owned. This new, lightning-fast tuner memorizes the tuner setting on each band. It then uses the memorized setting as a tuning start point or the nominal 50Ω setting next time you come back to that band. I have tried the tuner with a number of offbeat coaxially fed wire antennas, and I've found a match every time. ICOM's tuner matching range appears somewhat conservative.

With the elimination of all the tuner preset controls, the under-the-cover controls now number only five: MARKER ON/OFF, CALIBRATOR, ELEC-KEY WEIGHT, ANTI-VOX, and SCAN SPEED.

Key Convenience

ICOM also added a transmit microphone tone control to the bank of push button controls on the bottom lefthand corner of the front panel. This appears to be a set-once-and-leave-alone control. I guess ICOM has realized that not many amateurs want a complicated desk mike, like the SM-10, when a simple tone control could suffice in 90% of all cases.

One really nice convenience for an old straight-key hack is the inclusion of a straight key jack over and above the usual electronic key jack. Instead of wondering which is tip or ring, as with previous ICOM HF rigs, and miswiring the plug in the process, ICOM has made it almost foolproof. And you can choose your style of keying.

ICOM has moved the FUNC key to the former position of the HAM/GENE and replaced it with an SSB mode key. As a result, all the rig's modes are available with a single keystroke rather than the previous FUNC + key sequence for some modes. Some of the mode keys include a narrow mode on the second press of the same mode key. Narrow bandwidths are available on the CW, RTTY, and AM modes while a second press of the FM key activates the FM tone encoder.

A 250 Hz super narrow CW filter select has been added which is only active in CW narrow mode. The familiar passband tuning control

has interestingly vanished. However, the IF shift seems to work quite differently from any of the former ICOM rigs I have owned. It is quite effective in shifting the IF passband to completely eliminate an interfering signal. Could it be that when ICOM eliminated the PSB/IF combination, they rethought the design of the IF shift function?

Why Not Two AGC Functions?

ICOM has continued its tradition of providing a selectable receiver AGC, automatic gain control, that is either off, fast release, or slow release. The AGC circuit either takes "hold" or attacks very quickly. But the decay speed is variable; this means that, since this circuit actually reduces the receiver's overall gain in the presence of strong signals in its passband, a weaker background signal may not be easily detected. Not since the IC-740 have I seen a continuously variable AGC until recently on the IC-781. Why, with today's technology, don't manufacturers provide two AGC functions on a single concentric control—one to vary the AGC attack time constant and one for the AGC release time constant?

ICOM has also included a notch filter on the IC-765 very much like the one on its predecessor, the IC-761. The notch filter depth on my rig can take a CW signal from S-9 + 30 down to about S5. This is pretty good, except that the notch is so narrow it is very easy to miss the notch "window" when setting the notch frequency control. It's too bad ICOM did not include some kind of notch frequency automatic tracking and lockup, as the Datong FL-3 Multimode Filter does.

The "select memory" scan is a new feature. Press the SELECT button in the upper right corner to select the memories you wish to scan in the memory recall mode.

Under the Covers

The interior of the IC-765 is spacious. All modules either have their own casing or they are covered by metal panels and separators, providing reasonably good shielding, which in turn helps reduce the coupling of stray noise among the various transceiver modules. The CPU and PLL modules are completely isolated in a metal enclosure under the power supply, just under the top cover.

ICOM has liberally used coaxial cabling between modules, reminiscent of some of the more expensive commercial and military design techniques. Of course, this helps reduce receiver noise and susceptibility to personal computer hash. This is an improvement over the interference my PC used to generate on an IC-751A I owned.

The IC-765 in Action

There is not too much I can say about the IC-765's transmitter other than it yielded the specified 100 watts minimum on all bands. The transmitted SSB envelope pattern appeared identical and quite asymmetric on both sidebands. The SSB Christmas trees looked good.

When I switched the speech processor on, the rig did not flat-top on voice peaks, not even when both the ALC and COMP were intentionally misadjusted.

I also checked my IC-765 under high VSWR conditions and found that the transmitter quickly folded back output power after a sustained mismatch above 3 to 1. Under these conditions the transmitter's cooling fan worked almost continuously. Under normal SSB transmission conditions and proper load to the transmitter, the fan hardly ever came on.

The newly added transmit microphone tone control seems to work on my rig. However I have not really figured out how to optimally set this control. Remember, transmitted audio quality is not only a function of your rig's design and audio circuit, but also the speaker's voice and the listener's ears. With most hams getting older, and maybe more deaf, I have to wonder about the benefit of this control and microphones like ICOM's SM-10!

Although my IC-765 did pick up some hash, it was less than S1 on 10 meters.

The IC-765's control program is contained in a single EPROM which in my rig was socketed! I wonder if ICOM is going to offer EPROM upgrades in functionality?

Dust?

One continued irritation I have had with the IC-765 is dust. Yes, dust! Whatever the reason, small dust particles repeatedly lodge themselves behind the large clear plastic digital display cover. ICOM provided no way to dust behind the cover, nor have they sealed it from dust. I have had to take off the entire front panel twice to remove the nagging dust particles.

My IC-765 was not without a minor problem. I got the rig in March and ran it almost every waking hour until about June. Then I discovered that on initial powerup, the PLL wasn't locking up on the lower 200 kHz of every band segment. Like most intermittent problems, it went away once the rig had been powered up for more than a minute. I called ICOM service in Washington state immediately. They eagerly helped me perform a few basic checks on the rig and concluded that they had to see it.

I shipped it off to ICOM, and within a few days they had looked at it. Apparently, the DDS unit needed a slight adjustment. I guess minor adjustments are not uncommon on first-production run rigs. I also learned that when ICOM America first got my rig from Japan, they subjected it to a thorough checkout and burn-in for at least 72 hours before delivering it to me in March. I guess ICOM is being extra cautious on first-production run deliveries of equipment.

Without a Glitch

At the time of writing this review, the IC-765 has performed flawlessly for months. In my opinion, it's one of the best HF rigs ICOM has ever made. It may be less expensive than the IC-781, yet slightly better in certain areas. This in my estimation makes the IC-765 a good buy for the money! 73

You may contact Michael Cobuccio WA1EYP at M.K.E.J. Associates Inc., 16 Westminster Lane, Merrimack NH 03054.

Number 11 on your Feedback card

73 Review *by Bryan Hastings NS1B*

Alinco DR-570T 2m/70cm Mobile Transceiver

Alinco Electronics Inc.
20705 S. Western Ave., Suite 104
Torrance CA 90501
Tel. (213) 618-8616
Price Class: $750

Look Ma, no eyes!

A 440 MHz/2m mobile rig is becoming an increasingly useful travel companion. The 2 meter band nowadays is very crowded, especially in metropolitan areas, and more and more repeaters are sprouting up on the higher frequency bands, especially on 1.25m and 70cm. Even in rural southwestern New Hampshire, I can access three 440 MHz machines, and as many on 2m, during my half hour commute between work and home.

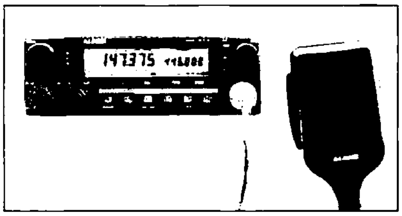
Yes, there are more hams who operate mobile than ever before, and the push is on to make mobile operation ever easier and safer. As I found out over several months' use, the Alinco DR-570T is right up there with the best of them. Read on to find out why!

Specifications

The manual claims a power output on the high setting of 45W and 35W for VHF and UHF, respectively, and 5W for each on low. Tests at *73* HQ showed that the 570 met or exceeded these specs. The high power levels are about as high as you'll find on any mobile rig on the market today.

Bear in mind that the maxim, "the more power out, the merrier," doesn't always hold true for repeater operation. The ideal situation is to be in reciprocity with a repeater, where both the mobile rig and the repeater begin to hear one another at roughly the same time as the mobile station approaches the repeater. I found, though, that the high power out/receiver sensitivity balance on the 570 is very good. Operating while approaching, and receding from, ten repeater systems in this area, there was reciprocity in all cases.

On 70cm, the 570 receives only in the amateur allocation (440–450 MHz), but on 2m it receives between 130–169.995 MHz. In many rigs, receiver sensitivity is optimized for the ham band, and drops off sharply out of band. This didn't appear to be the case with the 570—at least up-frequency from the 2m ham allocation—judging by the plethora of weather service stations and public service channels I received on 162–163 MHz and 150–160 MHz (recall that I do not live in a metropolitan area).



Front panel of the Alinco 570T.

Features and Operation

The 570 has nearly all the features that have become *de rigueur* for mobile rigs: full cross-band duplex; memory, programmed, and open channel scan; tone encode; CTCSS (tone encode/decode) with 37 selectable tones; standard (±600 kHz for 2m and ±5 MHz for 70cm) and non-standard offsets; priority and call channel; and offset reverse.

Full duplex operation—also known as "telephone style" operation since you can both hear and talk at the same time—is one of my favorites. Hopefully, we will soon see more full duplex repeater sites springing up. One of the challenges in ham radio is to make our communications more effective and meaningful. Although there are times where being in either only the talk or listen mode is best, full duplex really helps an animated and creative discussion flow.

For some reason, some manufacturers don't seem to pay enough attention to heat-sinking the finals to support lengthy key-down periods. I was first alerted to this while using another name's dual bander in full duplex, and the smell of melting vinyl wafted from the front passenger seat (on which the rig sat) after about five minutes. One of Alinco's predecessors, the 24T, quickly became too hot to touch when in full duplex.

Alinco addressed this problem in the 570—the heat-sink fins have nearly three times the surface area of those on the 24T. It remains very warm, but still touchable, after 10 minutes of key-down.

The scan modes worked as advertised. The VFO scan is really just a programmed scan with the band edges as the scan boundaries (in memories 7 and 8). If the programmed scan is set within the band edges, and is activated, the rig does NOT jump to within the boundaries before starting to scan, but tunes until it gets within that range. It scans in one direction only, determined by the direction the VFO was last tuned (either up- or down-frequency), rather than oscillating between the two boundaries.

Memory functions are as simple as you can get with a rig that doesn't have direct frequency entry. To enter a memory into a cell takes four keystrokes and VFO and memory tuning.

One of the local 440 MHz machines I regularly check into uses tone access. The tone encode worked as advertised on the rig. You see the actual sub audible tone frequency (e.g., 88.5 Hz) when in tone set mode, instead of a channel number some rigs show.

The non-standard offset is a little unusual—it works by putting the transmit frequency in memory 9, and tuning the VFO for the receive frequency. There is selectable VFO lock, and I discovered that the VFO automatically locks during transmit.

Manufacturer's Specifications

General	
VHF	Receive: 130–169.95 MHz/Transmit: 144–147.995 MHz
UHF	Receive/Transmit: 440–449.95 MHz
Mode	F3 (FM)
Tune steps	5, 10, 12.5, 20, and 25 kHz
Antenna Z	50Ω unbalanced, female UHF connector
Power	13.8V DC
Current Drain	Receive (squelched) doesn't exceed 500 mA (13.8V DC)
Transmit	VHF High/Low Power8A/4A UHF High/Low Power7A/4A
Dimensions	5¾"W x 2"H x 8½"D
Weight	3.74 lbs.
Transmitter	
Output Power	VHF High/Low 45W/5W UHF High/Low 35W/5W
Modulation	Variable Reactance FM (Phase Modulation)
Deviation	±5 kHz maximum
Spurious Emissions	More than 60 dB below carrier
Microphone	Electret condenser
Receiver	
Receiving system	Superheterodyne, dual conversion
IFs	VHF 1st 10.7 MHz, 2nd 455 kHz UHF 1st 30.825 MHz, 2nd 455 kHz
Sensitivity	0.30uV for 12 dB SINAD
Selectivity	More than ±6 kHz at 6 −dB Less than ±12 kHz at −60dB
Audio Power	1.5–2.5W
Speaker Z	8Ω

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Alinco

continued from p. 26

I find the reverse toggle useful. I use it mainly to see if I have come into range of my contact's direct signal, so we tie up the repeater as little as possible.

Unusual Features

The first thing that struck me about the 570 was the amount of separate controls there are for each band. The LCD display shows the frequencies for both the main and subband. The only difference between the main and subband is that you transmit only on the main band; other than that you can receive on both (even simultaneously) and separately adjust the AF, squelch, and VFO. This lets you monitor both bands without pressing even a single keystroke—and if both are active at the same time, and you want to focus on the main band activity, just press the MUTE button to attenuate the subband audio by 20 dB. Press TWIN if you want to shut the subband off entirely. You have effectively two separate rigs under one cover!

The band/sub key swaps 2m and 70cm between the main and subband. Each band contains either 2m or 70cm frequencies only, at one time.

The 570T can be turned into a cross-band repeater with no modification! Just take the top cover off (seven screws) and find the pushbutton behind the front panel on the left-hand side as you look at the front panel.

ABX puts the subband frequency into the main band whenever there's activity on it, and keeps it there for a few seconds after it becomes inactive. The bell function tells you of activity on a channel, even when your AF is turned all the way down.

I think the most impressive features of the 570 by far are its tactile and auditory aids, critical for mobile work since you need to keep your eyes on the road as much as possible. All 20 controls are located on the front panel, and most of the pushbutton controls are large enough to accommodate the broadest (and clumsiest) fingertips. In fact, the six dual-function pushbuttons along the bottom edge of the front panel have unique raised patterns on their surfaces which let your fingertip quickly find the right control. Nice touch!

Alinco almost went overboard with all the beeping indicators they've included. There are series of beeps to tell you when you're passing a MHz point while going up-freq, while going down-freq, while passing ½ MHz points, and while passing channels in memory. Using this with the 1 MHz rocker switch to the left of the display, you can quickly get well within ½ MHz of your desired channel without even glancing at the rig! If the beeping drives you to distraction, however, you can just shut them off with the beep toggle.

Manual

I found the rig's control setup intuitive, and so didn't consult the manual very much. If you need to, however, you'll find it modest but well organized. It is 25 photocopied pages, including pictorials of the front panel and LCD display, with numbered controls and indicators keyed to their descriptions in the first seven pages. The English text is formal in places but still very easy to understand. At this writing, Alinco is already shipping a more polished manual.

Nit-Picks

There are areas on any rig that can be improved. My suggestions for the 570 are:

Do not hard-partition the twenty memories. It's now set at 10 each for the two bands. You are much more likely to use many more memories for 2m than for 70cm.

Include standard offset directions as defaults. For example, receive channels between 147–147.375 MHz typically have a positive offset. On this rig, you have to set the offset, anyway, and it wouldn't take any more work to reset an offset for an unconventional channel pair.

Add detent and/or a sidetone for the DTMF keypad on the mike. With this pad, I always feel a little unsure when entering an autopatch number, resetting code for our repeater, etc.

In programmed scan, it would be nice if the VFO would jump to the scan area when this scan is activated. As is, at the scan rate of nearly ½ minute/MHz, it can take up to five minutes for the rig to tune to a given bounded area.

Put the transmit and receive channels for the odd offset into two memory channels, or have a selectable offset function. Tuning the receive frequency on the VFO is a bit of a hassle.

Conclusion

I used the 570 nearly daily for several months on both bands, and it didn't give me a whit of trouble. Audio reports were all very good to excellent. I was glad to see that Alinco zapped the design bug that caused the 24T to empty its memories every few weeks.

I recommend the Alinco DR-570T wholeheartedly. The few faults I found with it are minor. It is nearly as full-featured as you can want, and certainly one of the safest mobile rigs to operate that you will find anywhere! ■

73 Review *by C.L. Houghton WB6IGP*

Advanced Electronic Applications Inc.
PO Box C-2160
Lynnwood WA 98036-0918
(206) 775-7373
Price Class: $320

The AEA MX-6S 6 Meter SSB/CW HT

World wide hamming from a hand-held transceiver!

Six meter SSB/CW in a hand-held radio? You don't run into this kind of rig very often. This arrangement, however, makes a lot of sense. Six meters is like 10m: When the band is dead, no amount of output power works for skip wave, but when the band is up, you can work the world with a watt or less!

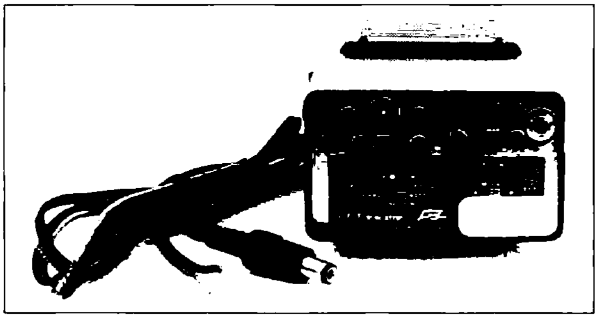

Photo A. Front and top panel of the DX Handy. This 5½" x 2½" x 1½" 6m 1 Watt SSB/CW transceiver weighs less than 2 pounds!

What It's About

The frequency coverage as supplied covers 50.1 to 50.150 MHz, and 50.200 to 50.250 MHz, using a variable crystal oscillator (VXO) giving 50 kHz of range per crystal. The first crystal covers 50.125 MHz, a common calling frequency. You select the two crystals by choosing channel "A" or "B" on the radio's top panel.

Rotating the VXO control knob adjusts frequency (top panel, upper right). A 180 degree rotation of the knob gives a 50 kHz adjustment per channel crystal. The dial scale is in 5 kHz increments. This is more than adequate as most of the six meter SSB DX use is in the first 50 kHz or so of the band. Only during periods of very high activity would you want to use another frequency, possibly setting the channel "B" crystal 50 kHz lower in frequency to give full 100 kHz coverage from 50.1 to 50.2 MHz.

The VXO knob is small, and the range is wide when you consider that you get only ½ revolution sweep, so getting right on frequency takes the fine touch. Fortunately, there's a Receive Incremental Tuning (RIT) control (top panel, upper left) that covers only 1/10 that range (5 kHz) range in nearly a full revolution—making it very easy for you to set the receive exactly where you want it, without changing the transmit frequency.

Operation

I used the HT on several mountaintop trips, including the ARRL 10 GHz contest. The contacts that I made were all Southern California ones, due to poor propagation on 6 meters.

All the feedback on the DX Handy I received was very good, especially reports on the audio quality. There was little distortion; my voice characteristics were still very recognizable on SSB. On receive I had no trouble copying weak signals, due to this unit's high sensitivity. Also, the radio was not troubled with overloading or crossmod interference when operating close to several very high-power TV and FM transmitting stations. At the test bench with the antenna removed from the DX Handy, I found no birdies whatsoever.

Internal Data

The MX-6S is powered by 6 internal dry "AA" batteries, with an additional spacer for NiCd battery operation. The 6 dry batteries total 9 volts with the spacer in place. However, when using NiCd batteries the spacer is removed and an extra or seventh cell (NiCd) is put into operation. This seventh NiCd cell brings the NiCd pack voltage up to 9.1 volts. An additional good feature is that the cells are all individual cells and not a full pack, allowing the user to make up an easy-to-repair battery system of dry or NiCd batteries.

Per the manufacturer's recommendation, the radio must not be operated from a 12 volt power source. This will damage the radio and void the warranty. With a 12 volt source, use a simple voltage regulator to supply a maximum of 9.5 volts.

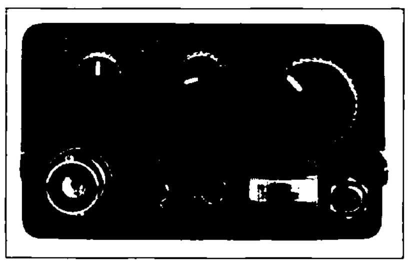

Photo B. Bottom panel of the DX Handy.

[Ed. note. . .Those interested in going mobile with the DX Handy should consider buying the Radio Shack Archer Universal DC Auto Adapter (#270-1560, $11.95). This adapter plugs into the cigarette lighter jack and has five output voltage choices, including 9 VDC, and six easily-swapped power connectors, including the one that mates with the DX Handy power connector.

The adapter is rated to 300 mA at 9 VDC, putting it well within range for using the DX Handy on receive (RX rated current drain: 70 mA). The rig's current drain on transmit is rated at 400 mA, 100 mA beyond the adapter's rating at 9 VDC. I enjoyed a 45-minute contact with Bob W1BDC with the Handy, however, including several transmissions exceeding five minutes, with no troubles. If you plan to do a lot of transmitting with this supply, however, it wouldn't hurt to keep a supply of 1A fuses at hand. . . .de NS1B]

The MX-6S has good frequency stability because of the crystal VXO and its varactor-controlled adjust circuitry (RIT). I did find that setting the frequency was somewhat less than accurate because the antenna was in the way of a direct observation. The dial calibration is very close to the antenna BNC connector. When the whip antenna was in use there was a slight parallax problem, but this situation doesn't cause much difficulty during normal operation.

Antenna

The supplied long whip (4'4") antenna was very effective. To be sure, an antenna close to ¼λ long at 6m can be unwieldy! For me, however, the gain/convenience trade-off is well worth it, since I would use this rig to spot band openings, and then head home to the base station when an opening occurs.

You can, however, further improve the field operation. A QSO with Bill KB6MCU on 6m SSB gave me a great idea: Use a small portable camera tripod as the base or counterpoise part of the whip antenna, mount the whip on the top of the camera tripod, and connect the radio with a short section of coaxial cable for portable operation. I tried it with a lightweight camera tripod and the perform-

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73 Review *by William Waters III N7IPY*

Ultra Comshack 64

Engineering Consulting
583 Candlewood St.
Brea, CA. 92621
Tel. (714) 671-2009
Price Class: $350, plus options

Remotely control your ham shack station from your HT.

Have you ever thought of owning your own repeater or operating your own remote base system? Have you been late for a schedule because you were unable to get to your station on time? Or just wanted to operate DX while sitting in the shade of a big tree in the backyard? If you answer yes to any of these questions, read on!

Run the Shack *In Absentia*

Ultra Comshack 64, a package that allows you to remotely control your ham shack, consists of one or more small PC boards that plug into a Commodore 64/128 computer, and a program on a floppy disk or optional ROM cartridge (see photos A and B). There are four modes of operation in this system, which include: HF remote and VHF remote base, repeater controller, autopatch, and code practice. A new feature supports a packet interface.

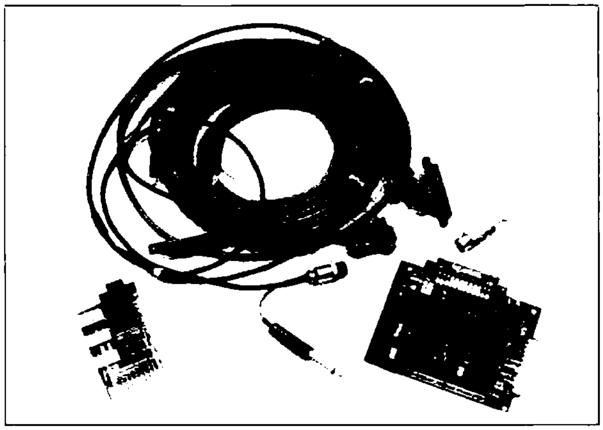


Photo A. The essential hardware for Ultra ComShack 64. The software comes either on floppies or in a cartridge that plugs into the back of the C-64.

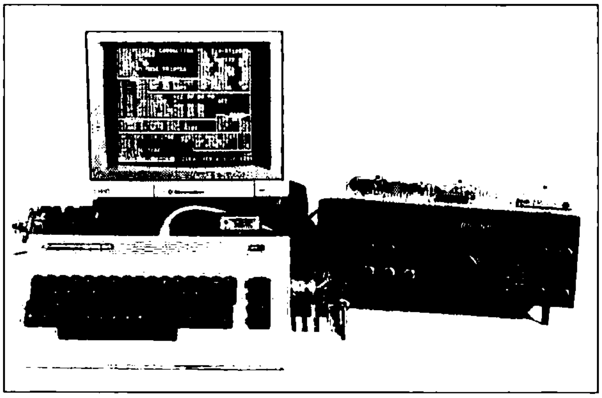


Photo B. The Ultra ComShack 64, with the software on the cartridge, installed in the Commodore 64. The program Main Menu is displayed on the monitor. The IC-761 is the remote HF base (not yet entered as remote #1 on the Main Menu).

First Glance

Initially, the box of wires, cables, and PC boards along with a 30-page *Users Manual* and a 5¼" Commodore formatted disk, was a little overwhelming. I had a chance to compare the old and new systems manuals, however, and found the new one vastly superior. The new manual is typeset; well laid out; contains additional information, including the packet feature; and has clearer diagrams.

System Needs

Along with the Ultra Comshack 64's main control board and software, you need a Commodore 64, 64C, or 128 computer, with a monitor and a floppy disk drive. Next, you need a dual-band (or separate VHF/UHF) transceiver as the base repeater or control link. The transceiver combination is used in full duplex mode, and therefore requires an antenna system that will work full duplex.

[Ed note: Ultra Comshack 64 does not easily interface, if at all, with the Commodore 128D, a graphically enhanced version of the C-128. In the first case, the C-128D port arrangement is different from that on the C-128 and is physically incompatible with the Ultra Comshack cards. Second, the Ultra Comshack program depends on the drive ROM configuration to run, and this chip differs from the one in the internal drive of the 128D.]

The remote bases must support a serial data communications port to allow the computer to directly control VFOs and other controls on the radio. Some of the rigs that will work include the Kenwood TS-940/440/711/811, the ICOM IC-735, and the Yaesu FT-757/767/980/727R.

The last radio you need is a dual-band handheld, such as the Yaesu 727, a dual-band mobile unit like the Kenwood 701, or any other VHF/UHF radio combination. This radio is used for all operations on the system over the base repeater. The control transceiver must have a touch-tone (DTMF) pad because all control operations on the Ultra Comshack are keyed with touch tones. Once the system is running, the software disables the computer keyboard.

Installation

With the many features the advanced controller offers, I decided to begin with a simple installation: one remote HF base and the autopatch.

All the cables, and the connector I needed for the CS64S controller board, were included. The CS64S controller plugs into the expansion port of the Commodore. A cable harness, consisting of three multiconductor cables about three feet long, terminates to a 22-pin edge connector that plugs into the CS64S to connect the rigs to the interface.

Also in the wiring harness were additional cables and connectors for various ports on the Commodore. The Users Manual has connection information for the above-mentioned HF/VHF/UHF transceivers. My original station layout required longer lengths of interconnecting cables, so after a short call to Engineering Consultants, I lengthened the cables to 10 feet each. Connecting to the HF remote base requires a mike, Push-To-Talk, headphone, and serial computer interface connections. The manual adequately covers installation.

My full duplex control link or base repeater consisted of a Kenwood 2600 2m HT for transmitting, and a TH-45AT 70cm HT for receiving. The CS64S interface requires a squelch signal from the control link receiver. After poking around inside the TH-45AT, and making a second call to Engineering Consultants, I found the signal I was looking for. The System Manual has examples of what to look for when trying to find the squelch signal, which I found useful.

After connecting the mike and PTT signals to the link transmitter (TR-2600), and the Au-

dio Out and Squelch from the link receiver (TH-45AT), I proceeded to plug in the various cables and boards to the C-64. With the hardware installed and cabled, I gave the installation a final check, and turned on the computer to configure the software.

IMPORTANT: Before making any connections between equipment, or plugging any boards into the computer, make sure all power is turned OFF! Plugging cards into the Commodore while it is powered could damage both Ultra Comshack hardware and the computer!

Software

I use version 7.4 software, the latest at the time I wrote this review. Most of the defaults were acceptable for the first installation. The new software release is menu driven. I found that the Systems manual clearly answered whatever questions cropped up about the software.

Operating the Program

The main program loaded and executed without a fault, and the operating screen displayed the system status and option configuration. Of particular interest was the status of the remote base unit and the link transmitter/receiver. A large dot was in the row next to the radio, in a column for Transmit or in a column for receive. At the bottom of the display is incoming command data from the link radio. Seeing the digits that I keyed into the keypad of my HT was useful. I used this feature to get used to the timing of the data entry operation. The computer monitor doesn't need to be on all the time, only when you wish to monitor system operation.

The current software supports over 100 commands. Table 1 is a list of some of the commands supported in version 7.4. At first I carried around a list of the commands, but I soon started using the Macro feature, which allows you to pre-define complex command sequences and access them with simple commands. Changing VFOs, beam headings, and other operations, are easy with macros. Every command the system recognizes is spoken by a voice synthesizer built into the software. The voice is a little crude, but understandable, and a must for proper operation.

Inverter Stage Mod

I soon found that all the functions on the TS-440S remote base were not changing as they should. I soon learned that, given my software version, and my hardware, I needed to install an inverter stage in the serial data link to the remote base. The CS64S interface has provisions for this feature, and required only a 2N2222 and two 10kΩ resistors. After performing the modification, which was outlined in the Systems manual, the remote base worked as it should.

Making a QSO

My first contact through the remote base was checking into the local 10-10 Wind Farms net. During the contact, I started by standing next to the system, watching it function and gaining confidence in its operation. As my confidence increased, I slowly moved into other rooms of the house, and finally outside. The usefulness of the macro feature soon became apparent as I used the remote base. Once I knew what I was doing, I operated the remote base from a friend's station about five miles down the road.

Autopatch

The autopatch supports both incoming and outgoing calls. I plugged the family phone line into the RJ11 connector on the CS64S interface board and tested the autopatch. When the controller detects an incoming call, the system pages the operator over the 2 meter link transmitter. The system user can then enter the proper code on his transceiver keypad, and answer the call. You can configure the paging mode to page in different ways, depending on your preference.

I tested the autopatch from my front yard. With only one phone line in the house, I resorted to talking with my helper, our eight-year-old son, Eric, on the cellular phone in my truck. This was an impressive feat; the Ultra Comshack worked great. I also succeeded in the opposite direction, by placing a call from my HT to the phone in the truck.

The software allows the operator to restrict outgoing calls to certain numbers, area codes, and prefixes. This is an important feature if the autopatch is to be left open for other users.

Remote 1 and 2 Command Examples

Command	Function
C or D	Scan Up or Scan Down
7	Stop scanning
#A	Change to LSB Mode
#B	Change to USB Mode
#C	Change to AM Mode
#D	Change to FM Mode
#0hhmmss	Set time in HH:MM:SS format
5A	Split on
5B	Split off
XXX•XXXXXA	Enter VFO A frequency
#•B	Rotate 10 degrees clockwise

Autopatch Command Examples

Command	Function
•5	Answer an autopatch page
•4XXXXXXX	Quick dial user entered number
•#	Hang up phone and end patch

Other Options

Rotor Control: Rotor control is accomplished with the HM-1 ($50) beam rotator control option. This hardware, along with the CS-8 (8-latch and relay control card), allows the user to control the Ham "M," Ham 4, or similar (CDR) rotator control box. The HM-1 interface samples meter voltage to determine beam heading. The voice synthesizer announces beam heading. This option allows for ± one degree accuracy with zero to 360 degree rotation control.

Relay Control: There are a total of 16 possible on/off control options available. The CS-8 relay control card ($80) provides for eight and the PK-8 provides the second group of eight. If the HM-1 beam rotator control option is being used, three of the eight control points on the CS-8 are used, leaving 13 for the station operator to use as needed. You can use these on/off control points to turn an amplifier on and off, change antennas, or any other function controlled by either a relay or an open collector transistor switch.

Talking Meters: Using the the PK-8 expansion interface, you can install two talking meters into the system. Each of the two analog meters can read a DC voltage greater than 12 volts. The hardware allows for calibration at the DC inputs. By setting a scale factor in software configuration, you set the range of voltage each meter can monitor. You can set a minimum and maximum trigger point for each meter, and a user-defined macro will be executed when one of the two extremes are reached. A user-defined message is then spoken by the voice synthesizer, announcing the condition. You can use this feature to monitor SWR levels on the remotes, temperature at the remote site, battery voltages, or whatever DC voltage the operator wishes to monitor.

Autoboot Cartridge: You can obtain a personalized program cartridge with the system parameters which will give the system the ability to operate without a disk drive. With the cartridge installed, the Commodore automatically runs the Ultra ComShack software at power on or at reset. You can still use the disk drive, to log if desired, and to load other configuration files. This option enables the Commodore to autoload and execute after a power outage or remote reset.

My C64 would occasionally hang due to power line noise, so the autobooting cartridge really helped when I wasn't near the system. Engineering Consulting provided the necessary software routines to copy configuration file number 1 from your working disk to a disk sent to them for programming the EPROM Autoboot Cartridge ($100).

Remote Reset: Occasionally, you might need to reset the computer and re-loaded the Ultra ComShack software. If you're not near the station, you have to use a remote method. You can do this with the TSDQ, 4-digit touch-tone sequence decoder and latch. This device operates separately from the computer, receiving its audio directly from the link receiver. You need the Auto Boot Program Cartridge for the remote reset.

12 Volt DC Power Supply: You can use a storage battery to power the computer and interface electronics with the model DCPS option. This switching power supply generates the proper voltages for the computer, allowing the system to operate from a battery back-up 12 volt power source. The switcher provides a crystal-controlled 60 Hz 18–20 volt AC signal which allows the computer to keep accurate time without using 115 V AC utility power. This feature is $120.

Packet: This is a new feature to the ComShack line and requires a second Commodore 64/128 computer. The PK-8 option supports a high speed data channel to talk to the second computer. The second Commodore is attached to the packet TNC, and the packet control feature sends "Voice Packets" to the master system. It lets you control the master system from packet. Packet and BBS with voice meters (see option above) and alarm inputs are $150. Packet interface and cable, linking PK-8 to C-64, is $50.

Soldering Iron Required

Installing the Ultra ComShack is not a project for the ham who is afraid of the soldering iron. To install the system, you have to make many connections and possibly attach additional wires into your transceivers. You can always find help at a local ham club for a project like this. It took me about six hours and three phone calls to Engineering Consulting to get my system on the air.

Once installed and on the air, you have a clutter of interconnecting wires going all over the place, and PC boards hanging out of the Commodore in all directions. But the many features and ease of operation outweigh the appearance.

The Ultra ComShack is an inexpensive and relatively simple approach to accomplishing the complex task of remote station operation. It is feature-packed, and the sky is the limit for ideas and ways to use it. ■

Number 14 on your Feedback card

73 Review *by Ted Drude KA9ELV*

AEA's New MM-3: The Morse Machine

Is this the ultimate CW memory keyer?

Advanced Electronic Applications, Inc.
2006-196th St. SW
PO Box 2160
Lynnwood WA 98036
Tel. (206) 775-7373
Price Class: $190.

Take heart, CW enthusiasts! In the midst of packet mania, no-code licenses, and digital everything, you're still in the hearts and minds of some ham radio equipment manufacturers. A case in point is the new MM-3 Morse memory keyer from Advanced Electronic Applications (AEA). AEA, who previously produced the MM-1 and MM-2 MorseMatic keyers, started hearing from CW enthusiasts when their original products went out of production a few years ago.

While computerized multimode data controllers, like the PK-232, were becoming all the rage, many hams were looking for a simpler CW alternative. There were still plenty of CW contesters and DXers out there who relied heavily on their old AEA MorseMatic keyers. So, after working for quite a while on an improved design, AEA finally released the new MorseMatic successor, the MM-3. AEA calls it, appropriately, "The Morse Machine."

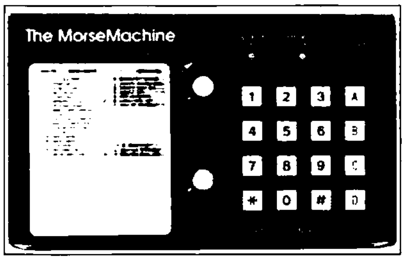
A Memory Keyer. . .and More!

While advertised as "the ultimate memory keyer," the MM-3 is actually more than just a memory keyer. It holds up to 20 different CW messages, with a total storage of 8,400 to 36,000 characters. But the MM-3 is also capable of operating as a programmable CW beacon, random code trainer, and a QSO simulator. While designed as a completely stand-alone product, the MM-3 also has a serial I/O port to interface with your terminal or computer, to act as a Morse code terminal with ASCII conversion. In short, anything you're likely to want to do with Morse code can be done with the MM-3.

What's Behind the MM-3?

The MM-3 is packaged in a small metal enclosure 7.4" x 4.75" x 1.9". The rear panel of the MM-3 has several jacks and connectors. Looking from left to right, first you have a DC power plug and two RCA phono jacks, SERIAL IN and SERIAL OUT, which form the optional computer I/O port. Next, an RCA phono PTT, push-to-talk, jack in case your transmitter needs a PTT line in lieu of a CW keying line; then a stereo phone jack for keyer paddles or a straight key, and a mini-phone jack for sidetone audio for headphones. Then you have two RCA phono jacks (with the proper male connectors) which provide both positive and negative keying outputs (+50V at 500 mA or −35V at 200 mA max.).

Finally, at the far right, there is a mysterious



AEA's MM-3 Morse Machine, the CW state-of-the art for enthusiasts.

DIN-5 jack labeled REMOTE MEMORY. This DIN-5 jack is clearly shown in descriptive diagrams in the 50-page *User's Manual*, and it's also shown in the MM-3 schematic, but its actual use is never fully explained. Most likely, it allows you to select keyer memories with a remote switch (good guess, huh?).

Front Panel Controls

Moving around to the MM-3's front panel, there is a touch-tone style keypad on the right with four extra keys: A, B, C, and D. The keypad is primarily used to set the mode of operation. For example: pressing the asterisk (*) and 5 on the keypad puts the MM-3 into the Trainer mode. Once in an operating mode, you can use the keypad to further select special features in that mode. For example, in Trainer mode, hit the D key, and the MM-3 will start sending random code samples. (If you set the MM-3 in the computer I/O mode, you can then send all the mode commands from any RS-232 port—computer, terminal, TNC, or what have you.)

At the top left of the front panel are four green LEDs which show the primary operating mode the MM-3 is currently in: Keyer, Memory Load, Trainer, or Beacon. Below these LEDs is a color coded command summary chart, showing the various keypad command sequences. While you'll still need the MM-3 user's manual for detailed reference, with a little experimentation you can figure out how to access most features from the panel chart. At the top right of the front panel are three more LEDs. Two yellow ones show which memory bank, A or B, is active at the moment. A single red TRANSMIT LED tells you when the keyer is putting out a signal to your rig.

In the center of the front panel are two pots. One controls functions as an on/off switch, and it also controls the volume of the CW sidetone audio. The other pot adjusts the playback speed of stored memory messages. It normally ranges from 5–45 wpm, but you can program it for other speeds as well. You can also control playback speed precisely via keypad commands, by punching in the exact wpm with the correct command sequence.

The Intel 8031 CPU and MM-3 Memory

The MM-3, a microprocessor controlled product, uses an Intel 8031 CPU, a second generation microcontroller in the 8051 family, but without a factory-programmed ROM. Instead, the MM-3 uses a socketed 27C256 EPROM for its firmware, allowing field upgrades. In fact, we received a new EPROM for the MM-3 while doing this review. AEA had modified the firmware to make the code speed control knob programmable from 2–99 wpm, instead of just the default 5–45 wpm.

As mentioned earlier, the MM-3 can store and replay up to 20 different CW messages. The two memory banks, A and B, store ten separate messages each, numbered 0–9. The memory for messages is loaded in a special mode, which also allows individual message editing. CW playback occurs in the keyer mode. You simply select the desired memory bank and message number on the numeric pad. Your message then plays back at the pre-selected wpm speed, or you can choose to vary it on the fly via the speed control pot on the front panel.

Character memory is stored in a 6264 static RAM chip. Standard memory is 8K bytes, or about 8,400 Morse characters. The 6264 RAM is socketed, and can be user-upgraded to a 43256 chip for about $25. That bumps the MM-3's memory to 32K bytes, or about 36,000 Morse characters. All the character memory is soft partitioned, and maintained with a lithium battery backup. Powered down, the MM-3 should still hold its memories for a couple of years!

Power Source and Draw

Any 9–16V DC power source, drawing about 350 mA, will power the MM-3. AEA sells an optional AC power supply for $16. Most users can probably use their rig's existing power supply. For those interested in operating the MM-3 on battery or solar power, AEA provides details on getting the current drain even lower. You can disable the sidetone speaker, disconnect the panel LEDs and serial port drivers, and replace a couple of its VLSI chips with CMOS equivalents, to obtain about

70 mA power consumption. This should especially interest those doing QRP and remote beacon work.

MM-3 Advanced Operating Features

The Keyer function of the MM-3 is a complete contest keyer with automatic serial number insertion and incrementing in any memory message. Serial numbers can range from 1 to 9,999. You can use the front panel speed knob to send at any speed from 2–99 wpm, or enter an exact wpm with the keypad, and then toggle between the two any time.

You can also select dot and dash memory on/off, audio sidetone on/off, dot-space or dash-space ratios, and bug, iambic or straight key modes, and many other parameters. In the Memory Load mode, you can enter and edit messages.

Trainer Mode

The MM-3's Trainer mode is especially powerful. You can set random code practice sessions for a specified duration in minutes, using programmable code speeds. You can have sessions with steadily increasing code speed. You can also select easy, medium, or hard character sets. All code sent by the MM-3 is echoed out the RS-232 serial port, so you can check your practice copy against the original by looking at a terminal or computer screen.

An interesting part of the Trainer mode is the QSO simulator, based on AEA's successful "Dr. QSO" cartridge for the Commodore 64 computer. The simulator allows the user to actually practice code via a simulated CW QSO. The MM-3 will call CQ, including a callsign, via its sidetone monitor and wait for your response. You can then converse with the MM-3 by returning its CQ with your own call and completing the QSO. (The MM-3 user's manual helps you understand the QSO process in detail.) We feel this is the most painless way for Novices and Technicians to get their code speed up, and they don't even have to fire up their rigs!

In the Beacon mode, you can program the MM-3 as an automatic CW beacon, repeating the message every 1 to 999 seconds. Use the keypad or RS-232 serial port-to-computer for programming. This makes it easy to remotely program the MM-3 Beacon via a phone modem or TNC link.

The MM-3 user manual describes several other creative "modes". With an AEA CP-100 computer patch, the MM-3 can be a Morse reader as well as sender. You can use the MM-3 to convert ASCII to Morse output for blind operators on packet, for example. You can also slow on-the-air Morse code down and copy it with a PK-232 controller.

Whether You're an Extra or a Novice

The MM-3 is a worthy successor to the original MorseMatic keyers. AEA has done a superior job in providing a new generation product for CW operators. The MM-3 proves you don't necessarily need a computer to keep up with the CW state-of-the-art. ■

You may write Ted B. Drude KA9ELV at 6170 Quito Avenue, Cocoa FL 32927.

73 Review *by Pete Putman KT2B*

MFJ's 941D Versa Tuner II

MFJ Enterprises, Inc.
PO Box 494
Mississippi State, MS 39762
Tel. (601) 323-5869;
FAX: (601) 323-6551;
Order: (800) 647-1800.
Price Class: $110.

Antenna tuner/SWR bridge in one versatile unit.

We amateur radio operators are fairly smart fellows, aren't we? After all, we have to master Morse Code and comprehend a wide variety of technical topics ranging from baud rates to beamwidth. We understand feedpoint impedance, reactance, resonance, angles of radiation, and the care, feeding and use of baluns, right?

So how do we account for all these guys who load up gutters as antennas, operate 160 meters using 15 feet of longwire in the attic, and insist on using a tribander to call CQ on 75 phone? Hmmmm?

The truth is that our world is full of compromise. Sure, we know darn well that a half-wave dipole for 160m takes up 240 feet, and it should be at least 60 feet above the ground to do any good, and we must use a balun at the feedpoint. Then we go outside, toss 30 feet of wire across some tree branches just out of reach, and try to work 4X4s with it. (Sigh . . .)

If necessity is the mother of invention, then compromise is the mother of the antenna tuner. There are probably more variations of this device on the market today than there are handi-talkies—a staggering thought! And yet without them, many amateurs would not have worked those 4X4s on 160, 80 or even 40 meters. The antenna tuner is indeed a key part of an amateur's station. And so it is for me with the MFJ 941D Versa Tuner II, a 300W PEP tuner incorporating an SWR bridge, power meter and 4:1 balun all in a tidy box.

Lured by Sunspots

After spending the better part of the last 6 years on VHF and UHF, I've grown accustomed to broad-banded 50Ω antenna feeds. But the siren song of sunspots has lured me back to HF and the attendant problems with antennas. I recently erected a Cushcraft A3 tribander with 40 meter add-on kit, and while it works quite well, my Kenwood TS-430S doesn't like to load into it at several points in the 40 and 15 meter bands.

As a compromise, I set the elements on the A3 for coverage of the middle portion of 40 meters, resulting in VSWR readings of over 2:1 below 7.090 and above 7.220 MHz. I also obtained 2:1 readings below 21.375 MHz (10 meters and 20 meters are under 2:1 across each band). Time to pick up an antenna tuner!

Why Use a Tuner?

Modern solid-state transceivers want to see a range of 50 to 75Ω in everyday operation. Internal ALC circuits measure increased collector current as a function of VSWR mismatches and "throttle back" the drive to keep maximum current below a specified value, thus insuring long life for your final transistors. Most transceivers have their ALC circuits set to "kick in" at about a 1.5:1 VSWR (75Ω), but the truth is that with ballasted emitter devices in the finals, 2:1 mismatches don't present much of a problem.

I've reset the ALC circuit in my HF radios to allow as much as a 2:1 mismatch, thereby allowing greater frequency excursions for a given antenna. It's only when impedances reach above 2:1 that things get tricky, and here's where an antenna tuner really helps out. But the important point to remember is to optimize your antenna for the chosen band. Get it as high as possible, strive for the longest possible physical length with respect to optimum, and use a good ground. If your tuner is looking at realistic impedances, it can be a potent tool.

MFJ Tuners, and the 941D in Particular

MFJ manufactures a bewildering array of tuners, starting with the 16010 Random Wire model and stretching all the way up to the MFJ 989C 3 kW version. I considered using the scientific method of closing my eyes and throwing a dart at the page to make a choice, but after careful study decided on the 941D for several reasons: (1) I only run 100 watts on HF; (2) it has a built-in SWR bridge/power meter; and (3) it will handle 2 coaxial lines, one balanced and one unbalanced line.

The 941D Versa Tuner packs quite a bit in a small package. It checks in at 3"H x 10"W x 7"D, and weighs just a couple of pounds. The chassis is finished in black, fitting right in with most of today's transceivers. Front panel controls from left to right are SWR SENSITIVITY, ANTENNA SELECTOR, TRANSMITTER MATCHING, INDUCTOR SELECTOR and ANTENNA MATCHING. In addition, pushbuttons select FWD/REV, 300/30W range, or POWER/SWR functions on the front panel meter.

Rear panel connections are for BYPASS COAX, COAX 1, COAX 2, and a combination of binding posts that allow connection of an unbalanced wire, balanced feedline and ground. The 941D has a built-in 4:1 balun for a 200 or 300Ω ladder or ribbon line, with a maximum rating of 300 watts PEP. Theoretically, you could have 2 coax lines and one longwire connected at the same time to the 941D. (Note that the BYPASS coax does just that and is routed around the tuner.) *Continued on page 82*

QRP

Low Power Operation

Michael Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

NR5A's 17m Receiver Converter

With a little luck, you should have a fully operational 30 meter transmitter running. This month, we'll look at improving it a bit. But first, I mentioned last month that I had a small receiver converter, and I'll get this out of the way so you can start getting a feel for the new WARC bands.

Jerry Felts NR5A designed this converter. You may contact him at PO Box 1033, Elder SD 57719. Be sure to enclose an SASE. Though I didn't have time to put one of these together before my deadline, I related some ideas to Jerry which I'll pass along to you.

First, take a close look at the schematic (Figure 1). The NE602 is used as an oscillator. Second, as Jerry noted to me in his letters, the front end is strictly guesswork. Third, I told Jerry that T-60-2 cores would increase the Q of the circuit. Fourth, the converter uses the 3.5 MHz band, which should be of special interest to HW-7 and HW-8 users.

The NE602 is very sensitive about its supply voltage. Although Jerry added a current-limiting resistor, I'd feel much better if a voltage regulator were added. The NE602 will go up in smoke if the supply voltage is over 8 volts. Install a 78L08 in place of the 2.2kΩ resistor. Of course, you could use a zener diode rated below 8 volts. If you can't find a 78L08 in the junk box, use a 7805 by adding some diodes in the ground lead of the regulator. This increases the voltage by 0.7 volts for each diode. You can also install a voltage divider and get the same results. Just play with resistor values until you're happy with the results. The bottom line is that you can always run the NE602 at 5 volts, with a tad less gain.

No matter how you build the converter, tune-up is quite simple. Just tune the front end for maximum signal, then tune the 10.7 MHz IF can for maximum signal. Repeat this cycle for maximum signal. That's all there is to it. I've included the front end circuits (Figure 2) you need for different bands. Again, I haven't tried out this converter, so builder beware; it may need some fine tuning. Address your questions to Jerry Felts at the address above.

30m Transmitter Mods

Now that you've got a receiving converter underway, let's get back to the 30 meter transmitter. This time around (see last column) we'll add a simple transmit controller.

I've used this circuit for years and have had no trouble at all with it. In fact, if you use a reed relay, you can get just about full QSK. The only factor holding you back is the receiver AGC recovery time.

Build the circuit on a small piece of perfboard and install it in the same cabinet as the transmitter. I placed the switching circuits on the same board as the transmitter circuit, but that placement isn't critical. I used a junk box 12 volt relay. If your junk box comes up empty, Radio Shack has a very good line to choose from.

Remember, the larger the relay, the longer it will take to go from open to closed, and vice versa. If you're not worried about QSK, you should have no trouble using what is on hand. Because the relay will be pulling in when the key is closed, the faster the relay closes, the less distorted the first character sent will be.

How the Relay Works

The switching transistor must be able to pass the current drawn by the relay. In my case, a cheap 2N2222 works quite well (see Figure 3). If the transistor/relay combination you pick causes the relay to hold in, after the delay has timed out, add some diodes in the emitter lead. Two diodes add about 1.5 volts above ground and keep the relay from staying on after the control voltage is removed—very helpful when using a sensitive relay.

Here's how it works. When you close the key on the transmitter, 12 volts is applied to the PA and oscillator. The relay key line is also connected to the PA supply line. The 12 volts passes through the diode and charges up the capacitor. The diode keeps the charge from being discharged back into the PA transistor. A simple RC network consisting of R1, R2, and C1, set the time. When the capacitor is charged very

Continued on page 84

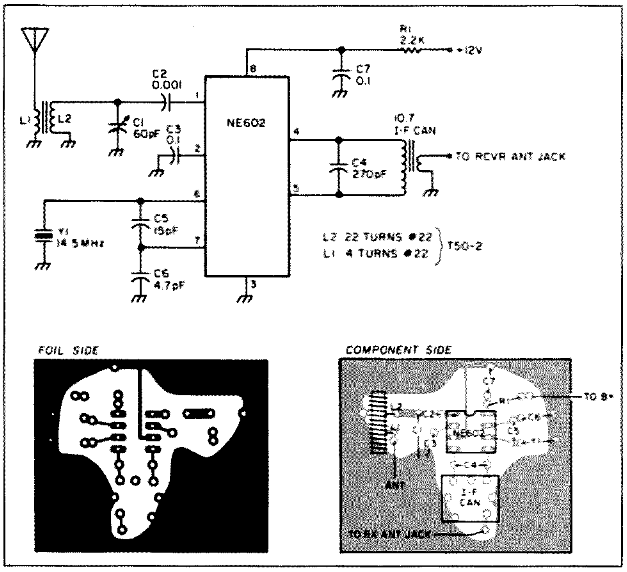


Figure 1. Schematic, parts placement, and PCB foil diagram for the 17m receiver converter.

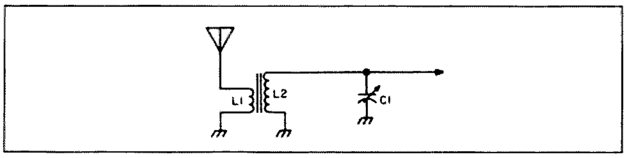


Figure 2. Front end for the converter. Values:

Band	*L1*	*L2*	*C1*	*XTAL*
30m	*3T*	*25T*	*50pF*	*6.6 MHz*
40m	*5T*	*51T*	*60pF*	*3.5 MHz*
20m	*2T*	*26T*	*60pF*	*10.5 MHz*
15m	*2T*	*20T*	*50pF*	*17.5 MHz*

Use #28 wire on T-50-2 for 40 meters. Wind the same gauge wire on T-60-2 cores for the other bands.

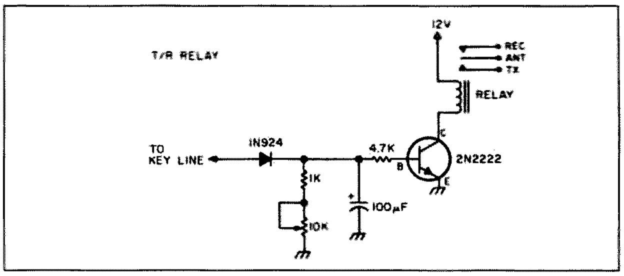


Figure 3. Transmit controller mod for the 30m transmitter.

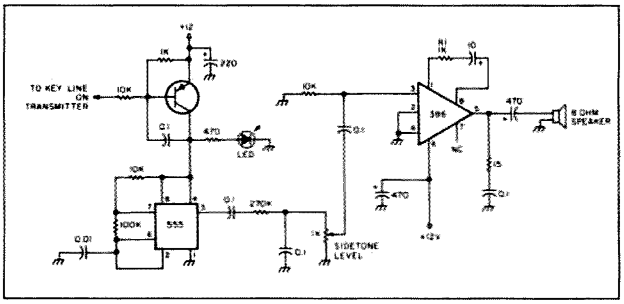


Figure 4. Sidetone generator circuit for the 30m transmitter.

Home-brew Spectrum Analyzer

Project for DXers and experimenters alike.

by Gregory R. McIntire KE0UV

If you've always wanted a spectrum analyzer, but figured it was way out of your budget, here's the answer! All the components required to build your own HF spectrum analyzer may be found in a well-stocked junk box. In the worst case, it'll run you less than ten dollars, as long as you already own an oscilloscope and an inexpensive, general coverage shortwave (SW) receiver.

Overview

This system is surprisingly simple. Imagine a "scanning receiver" whose IF output is rectified into DC. This DC signal is then fed to the vertical input of an oscilloscope. The scope's trace beam scans the face of the CRT at exactly the same rate as that of the scanning receiver. Thus, whenever the receiver scans across a received signal, a DC voltage proportionate to the strength of the received signal causes the trace on the scope's CRT to deflect upward. As soon as the scanner passes by the signal, the trace deflects back down. If the scan rate is fast enough, a continuous trace appears on the CRT with vertical spikes or deflections of varying magnitude which correspond to the RF signals in the path of the scanner.

This spectrum analyzer interface contains its own HF receiver. Simply tune the SW receiver to the portion of the HF spectrum you want to view, or feed the antenna input of the SW receiver with the wideband IF signal of your HF transceiver. Using the latter system, any signal on the frequency to which your transceiver is tuned will show up in the center of the CRT. This signal, too, marks the middle of the spectrum range the analyzer is looking at.

The amount of spectrum you can view depends on the amount of bandwidth available at the IF (before the final IF filtering) of your transceiver. This also requires that the IF frequency be within the tuning range of the SW receiver. If your IF is 455 kHz, you can use a simple AM broadcast band receiver.

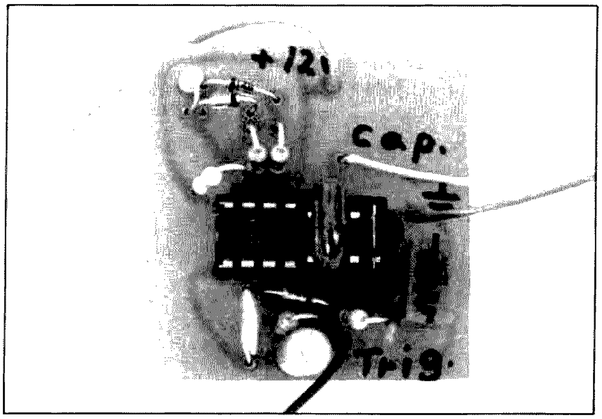


Photo A. Top view of the spectrum analyzer interface.

Theory and Construction

Since it's unlikely many of you have the same scope and SW receiver I use, I give relatively generalized instructions here. With a little care, however, you should be able to easily apply this idea to most models of SW receivers, and to almost any oscilloscope. If you have my particular setup, though, contact me for help on finding the specific connections on the DX-360. Please send an SASE.

First, obtain almost any simple, low-cost scope. I use a forty-dollar, 2 MHz, used scope.

Next, obtain a simple, LC tuned, shortwave receiver. My Radio Shack Realistic DX-360 works great. However, since I couldn't see the component side of the board, it was tough figuring out what was what. After a lot of trial and error, I found what I was looking for. It's easiest if one terminal of the tuning capacitor is connected directly to ground.

Now see the schematic in Figure 1. The receiver provides the signal (DC voltage) for the oscilloscope to display. All you have to build is a very simple device that will (1) cause the receiver to "scan" a portion of the HF spectrum and (2) provide a "sync" signal to the scope so it will also scan the CRT at the same rate.

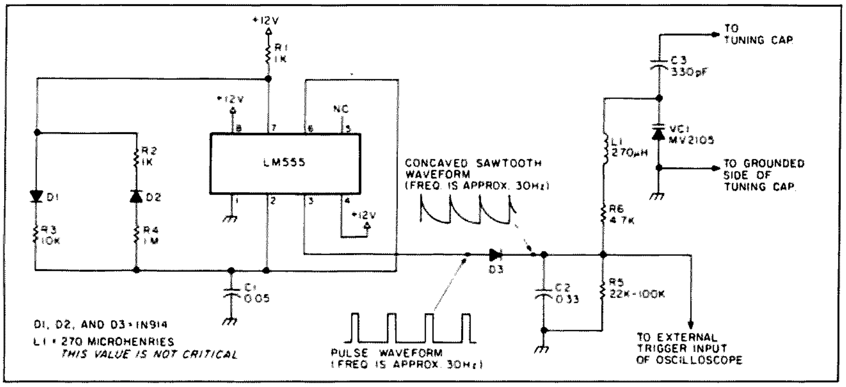


Figure 1. Schematic for the $10 or less home-brew spectrum analyzer.

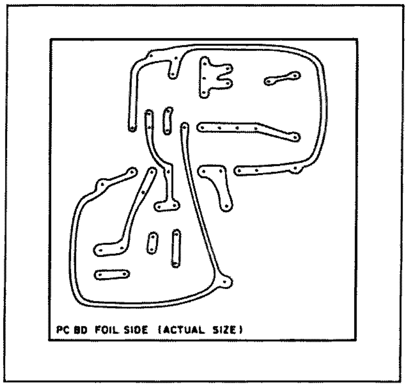


Figure 2. Foil side of board, actual size.

Two Birds With One Stone

The 555 timer IC takes care of both of the above. It is configured as a square wave generator, but with the ON part of the wave being very short relative to the OFF part. This is essentially a pulse wave. The pulse signal feeds a paralleled capacitor and resistor. The pulse charges the cap very rapidly, and then the resistor discharges the cap slowly. This creates a "concave" sawtooth waveform of about 25 Hz.

We need this waveform to create "linearity" of the scanning frequency of the SW receiver. The nonlinear characteristic of a varactor diode, and the nonlinear fashion in which the LC tuning circuit of the SW receiver operates, requires a nonlinear voltage to be fed to the varactor, but with its nonlinearity inverted in order to end up with *linear* tuning.

This DC voltage feeds a varactor diode (tuning diode) that is connected in parallel to the existing mechanical tuning capacitor of the shortwave receiver. The sawtooth wave is also fed to the scope's external trigger or sync terminal. (See below if your scope doesn't have an external trigger.)

Optimizing the Sawtooth Waveform

Select values of C2 and R5 to give a smooth concave sawtooth waveform as measured on the cathode of D3. This is a trial and error process. If R5 is too large, the scanning range is narrower and the minimum capacitance of VC1 will never be reached. The maximum capacitance range of the varactor—and thus the maximum possible spectrum scanning range—is never exploited since R5 will not be able to discharge C2 to zero volts. If R5 is too small, however, the scanning range will be at its maximum but will scan too fast. In this case, the waveform drops off very rapidly to zero volts before the cycle finishes.

You may want to make slight variations on

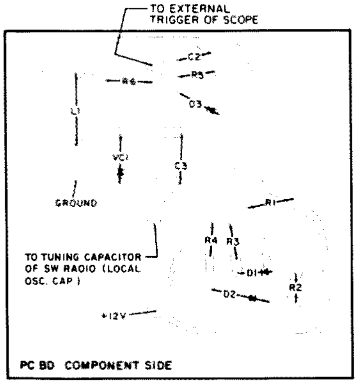


Figure 3. Parts placement on foil, enlarged. The 8-pin IC is in a 16-pin dip socket with pin 1 at 1 in the drawing. Leave pin 5 position undrilled to avoid breaking the trace from pin 4 to +12 volts. Note that C3 and VC1 plug into the 16-pin DIP socket for easy removal for experimentation. C3 and VC1 can also each be paralleled with other values via the unfilled DIP socket holes.

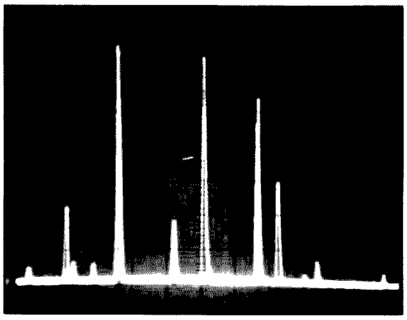


Photo B. The o'scope CRT showing signals in a 150 kHz piece of spectrum on 20m.

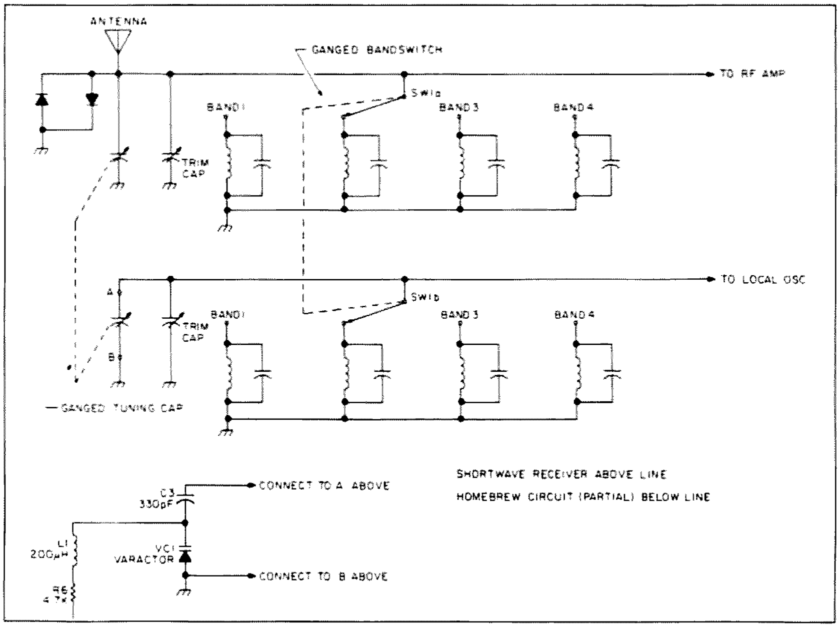
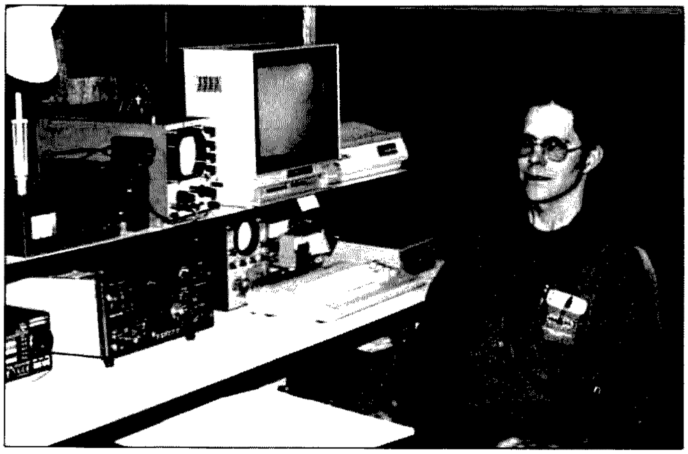
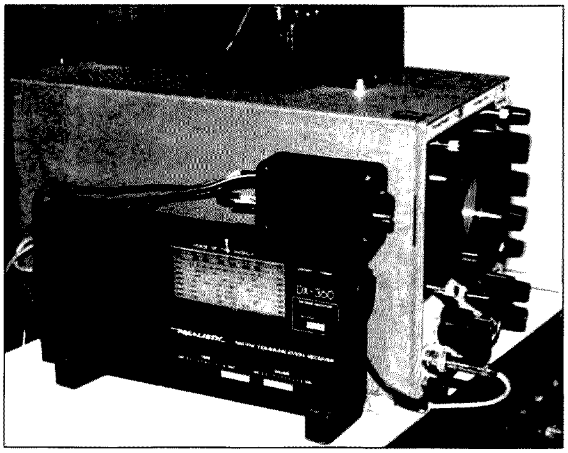


Figure 4. A typical SW receiver RF and local oscillator tuning circuit. The lead from C3 from the spectrum analyzer attaches to point A; the other spectrum analyzer lead (from VC1) attaches to point B.





Photos C,D. Greg KE0UV getting ready to to spot some DX on 10m using the $10 Spectrum Analyzer. Photo D is a close-up of the system, comprised of the o'scope, the scanning receiver (the DX-360) and the interface, which sits atop the DX-360.

these two values if the finished spectrum analyzer's display has wider spikes on one side of the CRT than the other. You'll likely need alter only R5's value.

If your scope does not have an external trigger input, you may be able to tap into the linear sawtooth wave inside the scope. In this case, you can eliminate the 555 timer circuit. Simply feed this sawtooth, which may need to be voltage divided, to obtain a level of around 0–12 volts, to the varactor. Couple the sawtooth to L1 through a capacitor. (Experiment to find the proper value of this cap—0.001 µF is a good starting point.) This will create the concave sawtooth waveform suitable for driving the varactor.

Setting the "Viewed" Bandwidth

The varactor tuning diode (VC1) I use is rated at 15 pF, but this can vary according to your system. You may need to change this value, and/or the value of C3, depending on how much scanning range or bandwidth you want. A 33 pF varactor gave too much tuning range; too much of the spectrum was displayed on the CRT, which caused a loss of resolution and melding of the displayed signals. I suggest using a 16-pin DIP package for the 555, so that you can use the extra eight sockets to try out different VC1/C3 combos. Remember that VC1 and C3 are simply two capacitors in series, so you can calculate what amounts of change will have what affects on the total capacitance, using the standard series capacitance formula: C1 x C2/C1 + C2.

If you are tuned to the high end of the dial of the SW receiver, you will want a small varactor, and vice versa. The values I chose give a display of about 325 kHz wide. The wideband IF of my Yaesu FT-101ZD is also about this wide, so this means I can view about 150 kHz of spectrum on both sides of the frequency to which the Yaesu is tuned.

Connect C3 and VC1, in series, across the *local oscillator (LO)* tuning capacitor in the SW receiver. Since we are tuning only a relatively small part of the spectrum, we don't need to tune the RF tank circuit. See Figures 4 and 5.

You may have to mount a trimmer capacitor, set at approximately the same value as the varactor diode (VC1), across the RF section. of the main tuning capacitor of the shortwave receiver. This is because the LO "scans" a slightly lower range of frequencies than the RF section of the tuning cap is centered on. I tried it without a trimcap and it worked, but I get higher AGC voltage to the vertical input of the o'scope with this trimmer installed, and thus taller spikes on the CRT display.

If room permits, mount C3, VC1 and L1 inside the receiver cabinet, as close as possible to the LO tuning cap. There is very little room inside my DX-360, so I simply soldered wires to each terminal of the tuning cap, (one of these wires is the receiver's ground) and brought the two wires to the outside of the radio via a ⅛" stereo phone jack. I used the third conductor of the stereo jack to bring out the AGC voltage of the receiver to feed the scope's vertical input.

Optimizing the Sync Frequency

I selected the frequency of the 555 timer circuit to give a smooth, sharp display on the CRT. It should generate pulses in the 20–30 Hertz range. Much below 20 Hz gives a flickering CRT display. Much above 30 Hz widens and smears the displayed signals, probably due to the SW receiver's AGC response time.

Make the connection to the AGC circuit of the SW receiver at a point before this AGC voltage is acted upon by any "timed decay" circuitry. If your SW receiver has an S-meter, try tapping into the AGC voltage there. Connect your scope to the S-meter, then manually tune the receiver across some shortwave signals and determine how fast the AGC voltage rises and falls. It should be *very* fast. If it is not, then work backwards from the S-meter till you get to a point where the AGC voltage is fast.

There's a point just after the IF filter where a portion of the IF is rectified. This is the AGC voltage. You may also be able to tap into the AGC voltage at the same point that it is fed back to the RF amp.

The aim is to probe around with the scope until you find a point where you get a DC voltage proportionate to the strength of a received signal with instantaneous response as you tune. When you find it, connect a wire to it. Bring the wire out of the receiver's cabinet and connect it to the vertical input of the scope.

The IF filter of the scanning receiver limits the width of each displayed signal. The narrower the filter, the better. I temporarily inserted in cascade (series) a 4 kHz filter with the 6-8 kHz wide filters in my DX-360, and got much narrower spikes on the CRT display. A 2 to 3 kHz filter would be ideal.

I recommend using a metal enclosure to keep out stray RF. Also, use shielded cable from the IF of the transceiver to the antenna input of the shortwave receiver, to keep everything *but* the IF out of the SW receiver.

Parts List

R1,R2	1k	¼ W
R3	10k	¼ W
R4	1 Meg	¼ W
R5	47k	(may be 22k–100k) ¼ W
R6	4.7k	¼ W
C1	0.05	disc ceramic
C2	0.33µF	electrolytic (any temp stable cap)
C3	330pF	mica or any stable cap (other values may be substituted, depending on desired scan range)
VC1	15pF	varactor diode MV2105
L1	150 to 300 µH inductor 43LS154 or 43LS564	
D1,D2, D3	1N914 or any small signal silicon diode	
U1	LM555 or NE555 timer IC	

DC Electronics, PO Box 3203, Scotts dale AZ 85257, (800-423-0070) has all the parts for this project. Since they require a minimum $15 order, you may want to get several values of varactor diodes.

Let the Fun Begin!

After constructing the simple interface, power it up with a 12 volt supply and listen to the audio of the SW receiver. It should have a buzzing sound as it very rapidly scans. Tune the receiver to a busy shortwave band. You'll note that the added capacitance of the varactor diode caused the dial calibration on the receiver to be a bit inaccurate, and that you will have to tune the receiver higher than normal.

If all checks out so far, turn off the power and connect the AGC wire to the scope's vertical input. Set the triggering function of the scope to *external* and connect the external trigger or sync input of the scope to either the concave sawtooth waveform, or to the pulsed wave directly from pin 3 of the 555 IC. Turn the power back on and adjust the scope's input attenuator until you get a display on the screen. Now set the scope's sweep speed until it sweeps the entire CRT at a rate slightly faster than the 555's frequency. I set my scope's timebase at 1 millisecond per division and use the variable sweep control to slow it down.

> ***"All the components required to build your own HF spectrum analyzer may be found in a well-stocked junk box."***

Now disconnect the antenna from the SW receiver, and connect the antenna input of the receiver to the wideband IF output of your transceiver. If your transceiver does not have an IF output jack, look for a source of wideband IF immediately before the IF filter, and bring it out via a wire. This signal is used only to feed the antenna input of the shortwave scanning receiver, so you can loosely couple it to the antenna input, with a resistor in line. Choose a resistance that will give maximum IF signal to the scanning receiver without overloading its front end. You may first want to use a pot with a known range to determine this, and then replace it with a fixed resistor with the appropriate value. I used a 100k resistor for the DX-360's input.

The last IF frequency of my Yaesu FT-101ZD is 8.9 MHz, so I simply tune the SW receiver slightly above that setting on its dial. Then I tune the Yaesu to a *strong* CW station and watch the spikes on the CRT until I identify the one that I am hearing. Next, I tune the SW receiver until that particular spike is in the center of the CRT display.

Now, as I tune the Yaesu, the signals on the display move left or right in such a manner that the signal I'm tuned to is always displayed in the *center* of the CRT screen.

If the IF of your transceiver is 455 kHz, replace the SW receiver with a simple AM broadcast band receiver. Tune the AM receiver to the low end of the dial, and you may have to use a 100 pF or higher varactor diode. (Simply parallel two or more varactors to get higher values.)

Of course, you can analyze chunks of spectrum the SW receiver itself tunes through. Just unhook the transceiver from the setup, and replace the SW receiver's original antenna (or something with higher gain.) Tune the receiver to the band of interest and view the activity on the scope CRT. One disadvantage of this is that, to maintain the same spectrum viewing width, you would have to swap in and out different values of VC1 for the lower, middle, and upper sections of the dial on the SW receiver.

So Now That You've Built It...

...what do you use your spectrum analyzer for? Imagine sitting in front of your rig in the wee hours of the morning, hoping to work some rare DX. As you sit and listen, slowly tuning across a seemingly dead band (which you know will soon be opening!), you have your eyes focused on the CRT. You see a small *pip* about three-fourths of an inch to the left of center; you watch it for a moment, just to be sure it isn't noise. Sure enough, it has the rhythm of a CW signal! Quickly, you tune downward and watch as it moves to the right. As it becomes centered on the CRT, you hear it. While working this station, you see another signal appear on the CRT. You quickly make your QSL info exchange and tune till this new signal is centered.

It's also useful for those who take an explorer's interest in what goes on on the E-M wave spectrum. For example, I am fascinated at watching and trying to analyze the myriad of sweepers, or "runners," on 10 meters as they go racing left and right across the CRT. As they pass the center, you hear a *peep*. A lot of strange stuff goes on on this band! If you are a birdwatcher, the only place you will ever SEE the woodpecker is on your spectrum analyzer. (And the woodpecker is indeed a strange bird to see!)

Conclusion

The most time consuming part of this project usually is trying to locate the AGC circuit and the local oscillator LC tank circuit of the SW receiver. Construction technique isn't critical, although the varactor should not be located too far from the LC circuit. I breadboarded this circuit using 12-inch long connecting wires, and it worked just fine. For display stability, however, keep connecting lengths as short as possible.

Now, you can build from the junkbox a feature for which avid DXers spend additional thousands of dollars in commercial amateur gear! 73

Gregory R. McIntire KE0UV can be reached at Hillsview Tr. Crt., Lot 92, Belle Fourche SD 57717. Greg KE0UV has been licensed since May '87, and has SWLed since '81. Other hobbies include beekeeping.

Number 17 on your Feedback card

ABOVE AND BEYOND

VHF and Above Operation

C.L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake
San Diego CA 92119

More on Frequency Counters and Accuracy

Last month I talked about commercial and surplus frequency counters. I suggested you pick up an older HP-5245 type counter because it's cheap and highly accurate. I checked the counter's internal standard using a low frequency receiver at 60 kHz.

At first, I had problems with interference. Connected to an outside antenna, the LF receiver not only picked up the desired signal, but some junk as well. It especially received the 15.750 kHz signals from the horizontal oscillators in most TVs. When operating near "dirty" TVs, the noise on the fourth harmonic almost covered the 60 kHz signal.

Low Frequency Calibration Antenna

To solve this problem, N6IZW came up with the easy-to-build ferrite antenna. With proper selection of the capacitor/inductor ratio, you can use it on almost any frequency up to approximately 1 MHz.

This high-Q ferrite rod antenna has a VMOS FET to convert the high impedance of the antenna to the low impedance of the receiver's input.

I got all components from the junk box. Bought new, components should cost no more than $10. At a local surplus store, I found ferrite rods 2" long and ½" in diameter. I stacked five of them to make a 10" rod and secured them with scotch tape. I went easy on the tape because I wanted to wind the coil close to the ferrite material. You can use other kinds of rods, including old ferrite loopstick antennas from FM radios. The bigger the better, up to about 12" long.

Winding The Coil

Making the coil is really a two-person job. You can do it by yourself, but the slow winding procedure, considering the number of turns, is tiring. However, you can make a small winding jig using a low speed motor. I used my cordless screwdriver. Securing a short, ¼" bolt head to the ferrite rod, I chucked the bolt in the cordless screwdriver. The low turning speed of the tool's motor, along with careful support, helped protect the awkward rod.

Hand-feed the #36 gauge wire in a lathe-like manner. Wind the coil in a single layer. Although I made a few winding errors, they didn't alter the antenna's performance. The coil has about 60–70 turns per inch.

Tune the coil to frequency with a 650 pF capacitor. Use a silver-dipped mica-type for high Q, and a variable capacitor for fine tuning adjustments.

See the Figure for details of the coil and amplifier construction. Parts placement isn't critical. You can put the finished coil and amplifier into a short piece of plastic pipe to protect them. Take the finished coil with its fixed and variable capacitor attached. Then couple a few turns on the coil for testing. This link is connected to your low frequency oscillator.

Next, calibrate the antenna to the desired frequency. I adjusted my antenna to 60 kHz by measuring the peak (high reading) voltage as it developed across the full coil-capacitor combination. You can adjust either the capacitor or the turns on your coil for 60 kHz.

The coil's 3 dB response was about 4 kHz from center frequency. Now I could attach the amplifier's impedance matching stage, a VMOS FET (VN10KM). It is tied source-to-ground through a 1k ¼W resistor with the common, or cold, end of the coil. The top of the coil is tied to the gate of the FET. Bypass the drain to ground with a capacitor, and power it with a 9V transistor battery. RF output to the receiver is capacitor-coupled from the low impedance source.

I have found that the ferrite rod antenna outperforms most antennas and offers quite a bit of noise immunity. It's also sensitive. It even provided a lot of rejection to a nearby high power, low frequency transmitter operating about 8 kHz lower.

I found a large quantity of the ferrite rods in a local surplus store. If you have trouble finding components for the ferrite antenna, I can get them for you. Write me at the above address. The five ferrite rods and a couple of VN10KM FETs postpaid is $7.

New Test Equipment

Recently I picked up an HP-5360A Computing Counter. It's even more accurate than the HP-5245. Though the counter's maximum frequency is 320 MHz, it shines in that it can resolve frequency to 1 part in 10 to the 10th. As Hewlett Packard states: "This counter can measure the time between two events to a resolution of 100 pico-seconds, about the time it takes light to travel one inch!"

I don't plan to measure light to that degree, but I'm very excited to have the counter. Less than two weeks later, my partner, Kerry N6IZW, also picked up the same type of counter from a different source. These counters are as rare as the proverbial needle in the haystack. They not only offer high resolution, but automatic frequency banding to input signals as well. Their time base is not normally found on available counters.

These counters have great range and auto-ranging. If you put a very low frequency signal, such as 12.xxx Hz, into the counter, it displays 12.123456789 HZ. Then with the same counter connection, shift the input to your 2 meter HT and key the transmitter on 146.52. The counter responds with 146.52000034 MHz, shifting the frequency range indicator from Hz to MHz automatically. Kind of makes you feel like a kid in a candy store with a no-limit credit card. I'll have more on this counter after I've used it a while.

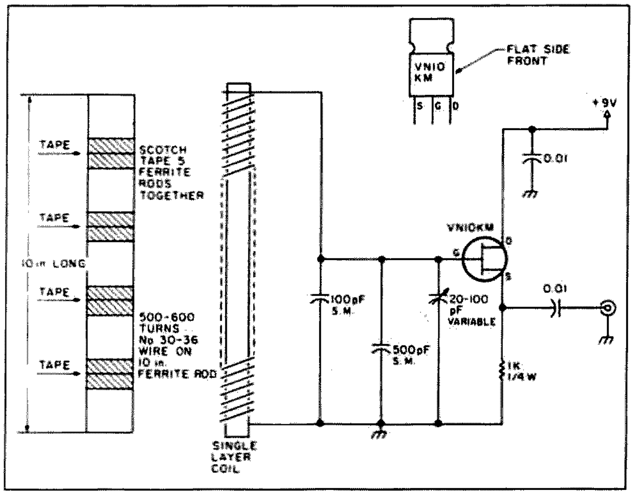
Mailbox Comments

Richard WA6JOX, Ventura County Amateur Radio Club President, is protesting the decision to remove the "New Frontier" column from *QST* magazine. He states that the future of amateur radio may well be in the microwave bands. His main point is: "NO NEW FRONTIERS, NO NEW SUBSCRIPTIONS!" Richard supports his point by taking a look at European and Japanese amateur radio magazines to see how far we are behind in this field. He says that he understands that the ARRL decision was made "for budget reasons, and not due to lack of material or interest."

Mark AG8N writes that he's looking for other interested amateurs in the northern Ohio area to band together, share ideas, and conduct microwave experiments. He's selecting sites for a possible link which would go into downtown Cleveland. Mark's address is 326 Township Road 1080, Polk OH 44866.

Kirk N7CCB has been rebuilding a Ribidium Beam, high accuracy, frequency standard (clock). Quite a project; something I've never had the opportunity to do. The Ribidium and Cesium Beam standards are the top of the line in frequency accuracy. We will report on his project as news develops.

N6IZW and I have been working out designs and PC board layouts for a simple phase-locked loop for



Construction details for the 60 kHz ferrite rod antenna. You can put the finished antenna inside a piece of plastic pipe 1" in diameter with plastic end caps to support and protect the antenna and amplifier. SM=silver-mica capacitor.

Continued on page 52

RTTY LOOP

Amateur Radio Teletype

Marc Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

BCNU in a New Way

We hams are fond, to say the least, of abbreviations. From DE to 73, from DX to WX, amateurs operating on CW and RTTY have always enjoyed using a string of upper case letters to represent a thought.

One of those strings is BCNU, short for "Be Seeing You," of course, rather figuratively used at the end of many a CW or RTTY QSO. Well, now all that can change. This month, I will begin looking at a way to really allow the fellow at the other end to BCNU, or anything else, for that matter.

If I mention digitizers, to most of you one of two images will crystallize. One is the expensive page scanner, able to convert a page of image into a graphics file. The other is the hand scanner, which is held in the hand to sweep a picture into a computer's memory.

The page scanner is nice, but as I intimated, rather expensive. The hand scanner, at about $200, is more affordable, but it can only scan flat objects about three inches across or so. What we need is a more flexible solution! This month, and next, I shall look at two of them.

Video cameras are no longer a rarity in American homes. With the proliferation of VCRs, camcorders are just a speck behind. That said, let's have a look at a video digitizer, a board that will convert standard video into an image that can be viewed on a computer screen, manipulated, and transmitted over radio or wire circuits.

The VC-1000 Board

As the IBM PC/XT/AT compatible category comprises the bulk of amateur computers, I'll cover two boards, one this month and the other next month, which allow you to import video images to these machines. Selling for about the same cost as hand scanners, they make exciting extensions for the home computer, with applications as diverse as digital RTTY pictures, desktop publishing, or entertainment at your kid's birthday party.

The Video Capture VC-1000 board, by Diamond Flower Electric Instrument Co., (USA) Inc. (DFI), is sold in many computer outlets. Setup is easy—just plug the board into an expansion slot in your computer, and plug an external controller into the board. Video is input to this controller, which features slide controls for brightness and contrast, as well as a switch for dithering vs. line art. Also, you can select the size of the image, within narrow confines.

When installed, the VC-1000 allows input of images from a camera or VCR, monitoring output on a local CRT, and storing them on a PC compatible computer.

Needed Hardware, Supplied Software

The DFI VC-1000 requires a PC compatible with at least 384K memory (640K recommended), MS-DOS version 2.0 or later, one available DMA channel, a free expansion slot, and a graphics display. The board is configurable for Hercules, CGA, EGA, or VGA displays. A mouse is optional, but it makes using the board a lot easier.

Figure 1. Main Screen for VC-1000 software.

Software supplied with the card lets you view four captured images. These may be different versions of the same image, captured in sequence, or entirely unrelated images. The viewable portion of each scan is a bit smaller than the actual area scanned, represented by a box superimposed over the miniature version of the scan, displayed at the right of the screen. Figure 1 is a sample command screen, featuring an image of my daughter, captured as image number one.

Captured images may be edited in a fat-bit mode, although the display is a bit hard to deal with, as no

Figure 2. Image at finest dither, setting 2.

Continued on page 52.

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston TX 77083

Photo A. WA5ZIB/6 monitoring UoSAT-OSCAR-11 using an HT near the Golden Gate Bridge. Listening to the digital voice encoder on the DOVE Microsat will be at least as easy.

Space Symposium 1989

This time last year, AMSAT volunteers were getting ready for the launch of four Microsats and beginning to work on the many requirements of the Phase 4 geostationary satellite program. And they're still working.

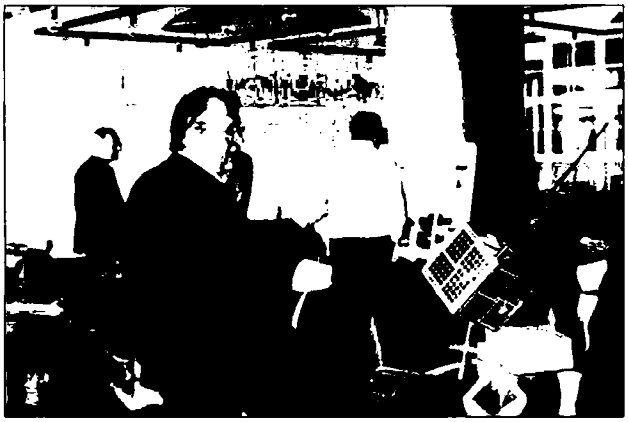


Photo B. AMSAT Director Dr. Tom Clark W3IWI gets in phase with the Microsat model at the AMSAT Space Symposium.

The Microsats, including two packet radio flying mailboxes, the Weber State College digital picture system, and the DOVE voice-encoder satellite, have experienced launch delays into the early part of 1990. They're ready to go; all they need is a ride into space.

The delays have allowed more time to organize ground-control activities and develop software for communications through the packet satellites, and picture display programs compatible with the Webersat imaging system. A few minor quirks have also been ironed out of the satellites themselves.

Des Moines, Iowa was the location for the 1989 AMSAT General Meeting and Space Symposium. Satellite enthusiasts from the US were joined by many overseas hams. Notable foreign attendees included AMSAT UK Secretary Ron Broadbent G3AAJ, AMSAT Italy V.P. of Engineering Alberto Zagni I2KBD, AMSAT Brazil President Junior Torres de Castro PY2BJO, AMSAT Mexico President Dave Liberman XE1TU and AMSAT-OSCAR-13 ground-control operator Ian Ashley ZL1AOX.

Hosting the event was the Central Iowa Technical Society, with long-time AMSAT supporter Ralph Wallio WØRPK as chairman. The Space Symposium program began at 8 AM Saturday, November 3rd.

Microsats and Phase 4

AMSAT Directors Jan King W3GEY, Dr. Tom Clark W3IWI and Dr. Bob McGwier N4HY joined with previous AMSAT Director Harold Price NK6K to present a complete update on the Microsat program, covering design and construction difficulties.

Stan Sjol WØKP and Bill Clapp presented details on the Microsat operations at Weber State College in Ogden, Utah. Webersat is identical to the packet Microsats for AMSAT NA and AMSAT Argentina, but it also has a height-increasing "penthouse" for additional experiments and the CCD (charge-coupled device) color camera.

Dick Jansson WD4FAB filled out the morning with a status report on the Phase 4 Geostationary hamsat program. A full-size model was built at Weber State College, shipped to Arlington, Texas, and displayed at the ARRL National Convention in June 1989. Progress on the mechanical design continues at a steady pace, but many questions concerning the control systems and radio equipment remain.

Afternoon talks ranged from current activities on A-O-13 to future space missions and even balloon-borne amateur radio television (ATV).

New Projects and New Software

AMSAT V.P. of Operations Courtney Duncan N5BF discussed AMSAT user projects for the future, including thirteen points concerning project management, interfaces to other organizations, techno-sports via satellite, frequency coordination issues and the creation of a Microsat Command Network.

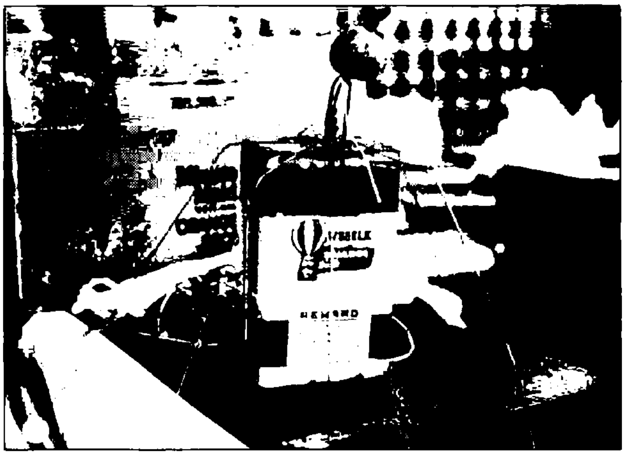


Photo C. Bill Brown WB8ELK's micro-balloon experiment included a 2m transmitter with internal batteries and attached ground plane antenna.

All four of the Microsats were constructed by AMSAT NA, but the satellite ham licenses (like repeater trustees) belong to four separate individuals in three different countries. Four different groups of ground controllers will monitor and control operations onboard the Microsats, but they will need to keep in close contact since the four satellites are extremely similar in design.

Everyone appreciated Franklin Antonio N6NKF's donation of Instant Track to the AMSAT Software Exchange, and the program features brought spontaneous applause during the slide demonstration. Check the November 1989 issue of *73* for a product review, but call AMSAT (301) 589–6062 for information on availability.

Ed Stluka W4QAU described the tethered satellite project, involving the suspension of an amateur-radio package on the end of a long cord or tether from the space shuttle. AMSAT Executive V.P. Dr. John Champa K8OCL, with the Solar Sail Program, presented new concepts, and Preston Carter described Lunar Polar Orbiter possibilities.

SAREX 2

AMSAT V.P. for Manned Space

Programs Bill Tynan W3XO (also known for his column, "50 MHz and Above," in *QST*) delivered the latest information on the upcoming ham-in-space activities from the space shuttle. In 1990 two hams are scheduled to go into orbit with amateur radio voice, packet and TV activities. Details on missions STS-35 and STS-37 will be forthcoming, but for now, get your 2 meter FM rigs and tracking software ready. Two-way packet connects and slow-scan-television activities will be possible. The astronauts, Ron Parise WA4SIR and Ken Cameron KB5AWP, are excited about promoting amateur radio with their experiments from space.

Imaging Activities and ATV

Jeff Wallach N5ITU explained the increasingly sophisticated methods used by amateurs to receive and display weather-satellite imagery. The picture quality was stunning due to the use of High Resolution Picture Transmission systems now on board satellites like Advanced TIROS. For more data on weather satellites, contact the Dallas Remote Imaging Group (DRIG) BBS at (214) 394-7325.

Bill Brown WB8ELK finished the Space Symposium with video tapes of his balloon launches carrying ATV to the edge of space. An image at 133,000 feet clearly showed the earth's curvature.

The Board of Directors Meeting

The AMSAT board meeting, open to all, took two days. The upcoming launch of the Microsats and Phase 4 were discussed. AMSAT spacecraft designers are eager to pursue new programs and projects, but funding is a major concern.

Phase 4, the geostationary hamsat, will require money beyond the abilities of the amateur radio community. Although AMSAT can easily build satellites like the new "cheapsat" under study (2 meters up and 10 meters down), and proceed with altered versions of the Microsats, we know that Phase 4 cannot be built and launched without serious outside commitments.

What do you want? What are you willing to support? Do we need further low-earth-orbit (LEO) satellites with easy-to-use analog transponders? Do we need a larger, more powerful variation of A-O-13? AMSAT DL in West Germany has recently received funding promises from their government for much of this program. Should we join with them to produce part of their system? Let me know! Write to me at the address above.

AMSAT NA would like to progress to geostationary satellites and beyond, using microwave bands and the fantastic volunteer expertise available, but it must have the cash and support to get there.

DOVE

Constructed in Boulder, Colorado, and sponsored by BRAMSAT, DOVE (Digital Orbiting Voice Encoder), is one of the four Microsats which should have been launched in late January, with the two UoSAT spacecrafts on the SPOT-2 mission, on an Ariane 4 rocket from French Guiana.

> ***"All four of the Microsats were constructed by AMSAT NA"***

U-O-9 was capable of transmitting synthesized speech using the National Semiconductor Digitalker chip set. FM deviation on the 145.825 MHz downlink frequency was low, and power output was limited to 350 milliwatts. DOVE will use the same frequency, but it can transmit up to four watts of fully deviated (5 kHz) FM using a more complex speech-synthesis system. It'll be easy to listen to DOVE on an HT. In addition to telemetry data, DOVE will also transmit messages created by students in elementary and secondary schools.

Tape-recorded material will be digitally stored on board the satellite for retransmission around the world. The original tonal qualities and speech inflections will be maintained for true reproduction.

For information on the Project DOVE Teacher's Guide, for teachers wishing to integrate this teaching-tool-in-orbit into the science, social studies and language arts curriculum, contact: Project Dove, %Richard Ensign, AMSAT Science Education Advisor, 421 N. Military, Dearborn MI 48124 USA.

Above & Beyond

Continued from page 45

local time base. We'll use this system to phase-lock our brick oscillators for microwave use. I'll have more information on this when we finish the project. We need reference oscillators in the 5 and 10 MHz range. I would be interested in hearing from any of you who might have such oscillators or know of a source for them.

Zack KH6CP/1 states that he hopes we enjoyed the 10 GHz Contest. The weather was lousy at his location. He climbed the Talcott Mountains in Connecticut and couldn't get schedules on 2 meters. He has kept active building an Avantek 10 GHz preamplifier using the ATF-13735 GaAsFET. Test measurements show a noise figure of 6.3 dB using an IC-402 in the IF system.

Larry K1LPS writes that Michael VE2DUB is trying to keep microwave projects going during the winter in the Montreal area. He is working on several 10.7 MHz IF systems and making a coat pocket (small) rig for 10 GHz. His best DX on 10 GHz was 83 miles, using a simple system and a 17 dB horn antenna.

K1LPS Proposes 10 GHz Rule Change

During the 10 GHz Contest, Larry K1LPS writes that the weather in the Northeast "...wreaked havoc both weekends. Some areas of the east were virtually rained out for the entire weekend. Those operators that have participated in past contests mentioned that the poor weather has been the same in prior years."

Larry proposes more flexible scheduling of operating periods. Being able to adjust to local weather conditions will permit greater activity and promote more interest.

Since microwave 10 GHz activity is largely regional, flexible scheduling would allow for rained-out weekends and other problems. Some groups might find it advantageous to schedule days during the VHF/UHF contest weekends.

The ARRL will consider changing the rules only if the majority of participants request it. K1LPS would appreciate your input about the proposal. Contact Larry Filby K1LPS at RFD #2 BOX 125, St. Johnsbury VT 05819.

Thanks for the fine input from all, and as always I will be glad to answer your questions. For a prompt reply please send an SASE with your questions. Best 73s, Chuck WB6IGP.

RTTY Loop

Continued from page 48

reference view is given to the enlarged view. Nonetheless, it's better than nothing, and perhaps more useful for cleaning up line type drawings.

Once captured, images may be saved in Microsoft Windows Paint (.MSP), GEM Paint (.IMG), Dr. Halo (.CUT), PC Paintbrush (.PCX), and Pagemaker (.TIF) formats. Conversely, any of these formats can be loaded, and resaved in an alternate form.

I found that images saved as .TIF files could not be loaded into Print Shop Plus, the graphics program that came with my Logitech mouse, despite the fact that PS Plus works only in .TIF mode. However, if I saved the files in .PCX format, the conversion routine that came with PS Plus, PCX2TIF, would successfully convert the images to a workable .TIF format.

I mention this problem because the graphics program that came with the VC-1000, Halo DPE, a special version of Dr. Halo designed to work with the VC-1000, is in my opinion, for all intents and purposes, next to useless. Used to the fine control of as simple a program as PS Plus, I was disappointed by the clumsy interface, limited choices, and non-intuitivity of Halo DPE. After installing the program on my hard drive and playing with it for a while, I just chucked the whole thing, and fell back to PS Plus.

Now, as to the images you can obtain. Figure 2 is a video capture at the highest dither available. For different applications, any one of the three dithers may be used.

Next month, I will look at a different board, similarly priced, to accomplish this task. While this one does not come with graphics software, it is capable of transferring images to other users. Each has its strong points, so there are no clear winners, but I hope to give you enough information to allow many of you to begin playing with digital images.

As always, I welcome your comments, criticisms, and suggestions. Reach me via USPS at the above address, or electronically on CompuServe (ppn 75036,2501) or Delphi (username MARCWA3AJR). After next month, let's all mean it when we say BCNU! . . de WA3AJR

73 Review by Steve Roberts N4RVE

The ICOM IC-725

An experiential viewpoint.

ICOM America, Inc.
2380–116th Ave. N.E.
Bellevue WA 98004
Tel. (206) 454–7619.
Price Class: $949.

This is not a normal equipment review. There are no lab test results and no objective comparisons between this unit and anything else on the market. My new ICOM 725 did not arrive with a *73* product-review assignment attached, nor have I really given the issue much thought.

What really counts in equipment discussion is the non-analytical impressionistic view that comes from experience, coupled with some commentary on how appropriate a product is for a given set of needs. And it was a specific need that drove my selection of this unit. . . bicycle-mobile HF operation.

Battery Operated Rigs

First, I have to say that no current commercial Japanese all-band HF rig is optimized for low-power operation. The two obvious candidates are the ICOM 725 and the Yaesu 747 (which also appears in slightly modified form as the Heath SB-1400). Both are fine units, but they draw a little over an amp on receive standby—far too high for casual all-night use on battery power. Compared to my old Argonaut 515, this astronomical power drain would have an inhibiting effect on operation.

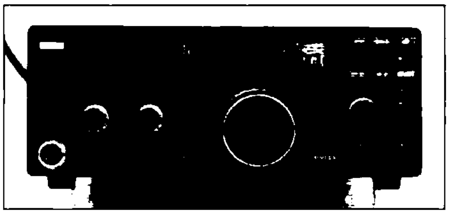
But life is a tyranny of trade-offs. On this next trip, I want more power, more features, more precision, more operating convenience, and remote operation. For all the pleasure of the old Argonaut (and no, I haven't seen the new model), it's time to move up. But the inevitable cost is more weight, more power drain, and more complexity. Is it worth it?

Yes!

My ICOM 725 is now shock-mounted in the comm bay of the new bicycle trailer. The 725 offers a serial interface port known as CI-V; this is handled by a local New Micros FORTH 68HC11 in communication with the network up in the console. The radio's audio input and output are ported to a crossbar switch that lets me conveniently operate with the Setcom helmet headset, a speaker mike, or through the UHF remote—and it's a simple matter to switch in filters and the like.

Its antenna output is cabled to a coax patch panel through which I can manually select mobile whips, external dipoles, the tuner, or whatever.

Reducing power drain is a little trickier, but I've managed an estimated 60–70% savings in standby current. The dial light is now switched, and the internal audio amp is bypassed in favor of the network. And it turns out that you can switch off the power amplifier when in receive with only a slight penalty in T-R delay. I'm rewiring the otherwise seldom-used TRANSMIT push-button for this purpose.



The ICOM IC-725.

Actually, I may retire the 100 watt power amplifier in the 725. The ICOM engineers thoughtfully made it an easily removable module. The alternative, not available in the US but commonplace in Japan, is a 10 watt amplifier. . . just about perfect for my lifestyle, and MUCH lighter.

725 Operation

So much for the custom installation. Fired up, whether in camp, on the road, or in a host's garage, the 725 is all business and a joy to use. It's a capable general coverage AM receiver as well as a multimode, all-band ham transceiver, and it has let me retire the trusty ICF-2002 digital shortwave I've carried for 16,000 miles. It has 26 memories (two of which work together for split-frequency operation on 10m FM or wherever), and two VFOs.

One of the nicest features is the architecture of the digital side of things, including what ICOM calls the "band stacking registers." (In essence, this makes it easy to wander around the bands and return to where you left off in each one without having to explicitly store the locations in memories. The operating mode is tracked intelligently, defaulting to the normal sideband in each case. Manipulating the data in memories and VFOs is simple enough to quickly become intuitive.

Tuning is very fast, and can occur in steps of 10 Hz, 20 Hz, 50 Hz, 1 kHz, 1 MHz, or by bands. The mechanism is simple—push-buttons labeled kHz, MHz, and band invoke annunciator arrows over the appropriate digits on the display, and turning the dial results in the corresponding tuning rate. All together, this results in real agility in getting around the spectrum, further augmented by three automatic scanning modes and UP/DOWN buttons on the microphone.

Controls

The 725 has RIT, of course, along with an internal 10 dB preamp and 20 dB attennuator (but no RF Gain control). There is also an excellent noise blanker, along with AF GAIN, SQUELCH, MIC GAIN, and RF Power controls.

Missing is fast QSK operation, which I came to appreciate with the Argonaut, though the delay on the semi-break-in keyer is internally adjustable and I haven't experimented with it. More significant is the lack of a passband tuning or similar control, though I rarely encounter QRM situations that can't be resolved with an external audio filter system that includes spatial synthesis. ICOM offers optional plug-in CW filters, with 500 or 250 Hz bandwidth. (I should note that AM and FM transmission require another optional module, though AM reception is standard.)

The IC-725 in Action

My actual performance evaluation is subjective, and is influenced by all the variables that affect any station. Signal reports and comments on audio quality are consistently excellent within the expectations of band conditions. I'm only using a dipole and mobile whip, but I have no trouble with moderately competitive DX.

And the operating experience itself—the feel of controls, the sound, the level of simplicity—are all superb. I've been a guest in a lot of shacks, and the IC-725 holds its own very well despite its small size.

ICOM offers companion automatic tuners (the AH-3 and AT-150) which are fully supported by the rig: just push the TUNER button. Also, the CI-V line makes it completely compatible with previous smart radios from ICOM. I'll be using the NM1D shareware Autolog program to control the radio from one of the DOS machines in the console, while also handling contact logging (or maybe I'll write one in Hypertalk for the Mac).

All in all, I can comfortably recommend this radio to anyone contemplating mobile operation, or anyone looking for a small-footprint rig for a crowded operating space. It seems to weather abuse well. . . since we're in a Santa Cruz layover, it has been extensively earthquake-tested. Indeed, it served as a lifeline to the outside world in the 3 days we were with no power.

Steven K. Roberts N4RVE is currently in a Silicon Valley layover, building the Winnebiko System 3, on which he will take off for open-ended international travel this spring. Detailed system descriptions and other stories appear in his bimonthly Journal of High-tech Nomadness, available for $15 from Nomadic Research Labs, P.O. Box 2390, Santa Cruz CA 95063.

LETTERS

From the Hamshack

Something for Beginners

After watching a ham operator in action, I decided to look into the hobby. I know absolutely nothing about amateur radio. I picked up your July issue in hopes of learning where to begin.

The one theme I understood was that the ranks of ham operators is dwindling and the hobby needs newcomers. But in this issue, I found the newcomer ignored. Nothing on how to get started, no simple explanations about equipment or license requirements.

I realize this level would be boring to your experienced operators, but surely a page or two devoted to the beginner is reasonable—or even a continuously running offer for free or low-cost reprints of such material.

How many people like myself might have picked up an issue with the idea of becoming a ham, only to become discouraged?

William E. Hugger
Essexville MI

Thanks for your letter—and yes, we don't have much for beginners. You wouldn't either if you were publishing. With ham growth at 0.8% in the last year, there are very few newcomers. If I publish stuff for beginners, I get hate mail and subscription cancellations from the old timers. And I hardly get any new readers, since there are so few beginners.

A few years ago, Ham Radio *started a new magazine for ham beginners. It went broke. There's a lesson there.*

In 1963 the ARRL almost totally destroyed the high school radio club infrastructure which kept us growing, so we've had little growth since then. And without those radio clubs, not much hope of growth.

Wayne W2NSD/1

William, see the November "Welcome Newcomers" for books, and look over the ads we carry for Novice courses. KA1UKM

Full Cycle?

Wayne's editorial in the last September issue seemed to accept and expound the theory that 60 cycle electromagnetic emanations from house wiring and appliances causes cancer and other disorders. It reminded me of an article published in *73*, "Electronic Health," by C.A. Moore, in the May 1971 issue, which boldly claimed in no uncertain terms that an apparatus constructed of a neon-sign transformer and a spark gap would *cure* cancer, "severe toothache and other pains," and generally "revitalize cells." If constructed and used per the article's directions, the apparatus would give the user a much stronger dose of 60 cycle and higher frequency emanation than "killer" electric blankets or video terminals! I guess it can't be said that *73* doesn't give space to both sides of a controversial issue.

Ron Johnson WA5RON
Austin TX

Delighted you remembered the article—I'd forgotten about it. Of course, the article doesn't say what you say it does. You're just trying to get my well-tethered goat. But the article certainly seems on target as far as pointing out that cells are electrical and seem to be affected by AC currents. The reasoning seems logical that AC magnetic fields may be able to help as well as harm cellular reproduction. It's certainly timely to get some experimenting done. I wish more readers had paid attention to the '71 article. The spark oscillator is primitive. We'd want to have close control over the frequency and field strengths, and experiment first on things like chick embryos before we start zapping humans.

But the idea that this might help things like skin cancer isn't that far afield. Something is going wrong with the cells, triggered by a growing number of agents of which we are aware, such as magnetic fields, smoking, UV, etc., all plus a necessary psychological component. Wayne.

Make Contact—Please Don't Disregard Us

I wish to praise KA1UKM for the splendid reply she made to WB2DSH in the November 1989 issue of *73*. I have lived in Botswana (2 years) and I have traveled extensively in South Africa. I moved to Liberia last summer. Several governments here in Africa do not live up to our ideals. It is too bad WB2DSH has set up the American media as his savior of Africa. Many news people come out here and have their copy all written, but just need some incidents to spice it up a bit. Much suffering for my brothers and sisters has resulted from these manipulated reports.

Kind words and gentle pressure in a contact will move more mountains (racism) than all the "blasting" out of a person will ever accomplish. Over here, many white folk are working with black Africans to make the continent better. Changes are coming. Please don't "throw out the baby with the bath water."

Dale McMindes
Monrovia, Liberia
West Africa

Unfair Coverage

After reading your [Linda KA1UKM's] November "Welcome Newcomers," I was wondering why our Radio School Novice class courses were not mentioned. Please don't leave us out of further editorials—even though you may be mentioning products only because you sell them. You may be selling beginners short on the tremendous number of well-prepared study guides, as well as computer courses. If you're truly going to cover the newcomer's scene, do more than read over your inventory on Mr. Wayne's bookshelf.

Gordon West WB6NOA
Costa Mesa CA

Gordon, I know your courses are excellent, but my goal was to inform people about the books we have on hand which I like. This was my idea—in response to calls and letters from readers asking about the books we have available—and I did NOT write it as a sales pitch. I wrote it to inform, and share my enthusiasm. Also, my intent was not to cover all the best courses available. Had I done so, with only one page to fill, I could only have made a list, with no descriptions. That would have been no better than the tiny, barely informative blurb in the Bookshelf.. Linda KA1UKM

Taipei, Taiwan. In the middle row, on the righthand rack, old 73s wait for new homes.

CW, A Valuable International Language

We believe those who do not use code are missing a crucial opportunity for the promotion of international goodwill. CW is the choice of many nonEnglish-speaking hams, not only because of propagation, but because some foreign hams cannot obtain SSB equipment.

CW is an international language, *even more than English.* Its abbreviations and conventions allow meaningful communication; cut down misspellings and mispronunciations, and help maintain correct word order. Since CW is slower than voice, the nonnative speaker can spend more time understanding the message and formulating a response.

Amateurs are working hard to bridge the language barrier. Len W6HJK has compiled "Russian Phrases for Amateur Radio." Goh N6UOK is preparing a syllabus of Japanese phrases. For those who know a foreign language, CW will remain a viable mode. For those just starting, CW can be vital. We are not necessarily promoting a *law* requiring CW for licensure, but we do believe in the *principle* that CW is profoundly valuable.

Goh Kawai N6UOK
Dept. of Linguistics
Stanford University, Mountain View CA
Len Traubman W6HJK
San Mateo CA

They Get Around

Have you ever wondered where old copies of *73* go to die? Well, I found the place: Taipei, Taiwan. Some copies up to a year old were reselling for $5–8 US at the Brother Hotel in downtown Taipei.

Peter Bealo WB2MJG
Plaistow NH

Meaningful Conversations?

In line with your campaign to clean up ham radio, I offer the following comments. I hope you'll accept them in the spirit with which they're written!

As you know, our on-the-air conversations typically could be generated and responded to by computer. In fact, some hams I suspect of being silent keys long ago, for their conversations never vary. But it turns out that restoring meaning to radio conversation would spell the END OF AMATEUR RADIO!

Yessir, it's there in the regulations: Only conversations which by reason of their unimportance are not considered fit to spend telephone fees on may be exchanged!

Obviously, our brethren in radio are not deliberately boring us with the same old information, neither are they so unintelligent that only the same old phrases fall from their lips. No. They are conscientious, rule-abiding operators who are meticulously following the letter of the law.

Instead of castigating them, you should be congratulating them! Such attention to detail protects our hobby and keeps our frequencies from being taken for meaningful purposes.

Cortland E. "Rich" Richmond KA5S

Number 22 on your Feedback card

PACKET TALK

Latest in Digital Hamming

Brian Lloyd WB6RQN
Telebit Corporation
1345 Shorebird Way
Mountain View CA 94043-1329

Better Frequency Coordination Needed!

My call is going home to California. By the time you read this, I will have moved from the Washington, DC, area to the San Francisco Bay area.

In many ways, it's easy to operate packet radio in the Washington, DC, area. Users have plenty of frequencies on 2 meters to choose from. The Mid Atlantic Repeater Council (TMARC, the local frequency coordinating committee) took an active interest early on and saw to it that there were plenty of frequencies available for packet radio operation. (In addition to 145.01–145.09 MHz, TMARC legitimized the use of 145.51–145.69 MHz for packet.) Those responsible for building and maintaining BBSs, digipeaters, NET/ROM nodes, and IP switches assisted by using 220 and 440 MHz, and the 6 meter, band liberally and effectively. This kept congestion, hidden terminals, and frequency use arguments to a minimum.

This apparently is an unusual case. Many hams who live in large metropolitan areas complain about the lack of available frequencies for packet operation. It seems that most frequency coordinating groups pay little or no attention to packet radio, probably due to a bias toward repeater operation (most of these coordinating groups grew out of a need to coordinate the use of repeater frequencies) and a lack of knowledge about packet radio. The solution is for packeteers to get involved in the frequency coordination process.

More Channels for Packet

Frequency coordinators need to understand that their decisions strongly affect other users of amateur radio besides the repeater users and operators. They need to know that packet radio's requirement for frequency coordination is different, but no less vital to amateur radio.

Yes, packet users can share a channel, but the number of users on one frequency at any one time is limited. Not everyone can be crammed onto 145.01 MHz and forgotten. Packeteers need solutions: either the allocation of more frequencies, or frequency coordination so they may use the frequencies they have more efficiently.

Packet On 2m

How is this most popular VHF spectrum split up? There are three major user groups who, because of the nature of their activity, cannot easily share their frequencies. These are the repeater users, the hamsat (OSCAR) users, and the weak-signal enthusiasts.

Repeater users concentrate in 144.51–144.89 MHz, 145.11–145.49 MHz, 146.00–146.40 MHz, 146.60–147.40 MHz, and 147.60–148.00 MHz. Satellite and space communications use 145.80–146.00 MHz. Weak signal operation generally takes place on and around 144.150–144.250 MHz. 144.000–144.100 MHz is reserved for CW operation.

Packet operation in the satellite subband and the weak signal part of 2 meters can be very disruptive. A satellite is essentially a flying repeater; any signal within its passband gets repeated on another band (usually 10 meters or 70 cm, in the current crop of satellites) and in many cases, you can hear their signals over large areas of the Earth. Unless you know for sure that there is no "bird" above the horizon with its 2 meter input enabled, don't use 145.800–146.000 MHz.

The weak signal enthusiasts occupy a very small part of 2 meters, but they are very sensitive to ANY emission in their part of the spectrum. They spend a great deal of time experimenting with propagation, and they examine any signal. Packet racket can raise havoc when you are trying to receive a signal that is only a few decibels above the noise floor.

Plenty of Room for Packet?

Gosh, it seems like all of 2 meters is used up, right? Wrong! The above only represents 2.760 MHz of 2 meters. 1.240 MHz are left for simplex voice and packet. This means that almost a third of the 2 meter spectrum is potentially available for packet operation, not just the 100 kHz from 145.00–145.10 MHz.

Start using this spectrum. No person or group "owns" a frequency. Do be courteous, but don't be shy. Packet radio uses Carrier Sense Multiple Access (CSMA); you can share the frequency with other users. Take advantage of that capability.

Before you begin to transmit on a frequency, find out whether it's in regular and general use. One of the simplest methods consists of putting a receiver on the frequency, and using the squelch line or a VOX to start a stereo tape recorder. Use one channel to record the audio from the receiver tuned to the frequency, and the other channel to record the audio from a receiver tuned to WWV. This way you can find out who is actually using the frequency, and when.

The repeater portion of the 2 meter band is not sacrosanct. Many allocated repeater pairs are little, if ever, used. Check with the local coordinating council to see what channels are and aren't spoken for. Use the monitoring technique mentioned above to locate unused repeater frequencies. You might also find repeaters seldom used and come to an agreement with the owners on packet use of the repeaters. A properly adjusted repeater is a MUCH better choice for packet operation than a simplex digipeater.

Plenty of spectrum is available on 2 meters for packet radio operation. You just have to look for it. Spend time "mining" the spectrum, and you may just find a few more frequency "nuggets."

Modems and Spectrum Efficiency

Most packet operation takes place at 1200 bauds using Bell 202 modems to modulate a narrowband FM transceiver. This is very inefficient; the packet signal occupies 15 kHz or more of bandwidth. Using an SSB transceiver instead of an FM transceiver is a possible improvement, but the Bell 202 modulation scheme (FSK with a 1 kHz shift using 1200 and 2200 Hz tones) generates a signal that will not pass through the average SSB transceiver without unacceptable distortion. One simple solution—change the shift.

There is no need to use a 1 kHz shift. With FSK, shifts as low as half the data rate (600 Hz for 1200 bauds) can be used. The question is how to do this using current TNCs. As it turns out, most TNCs support a different modem standard, V.23, that uses an 800 Hz shift. Instead of 1200 Hz and 2200 Hz tones, V.23 uses 1300 Hz and 2100 Hz. The spectrum for V.23 spans from about 700 Hz to about 2700 Hz. Compare this to the Bell 202 whose spectrum spans from about 600 Hz to 2800 Hz. Most SSB transceivers can pass a signal that is 2 kHz wide, but they have trouble with signals any wider.

Advantages of V.23

1. The overall bandwidth of the signal is about 2 kHz, seven times less than a Bell 202 modem driving a NBFM transceiver. Now you can get 25–35 packet channels into the space formerly occupied by only five channels.

2. The different modulation scheme buys you 10 dB or more link margin improvement. This means that you can use 1 watt of SSB signal to do the work of 10 watts of FM signal. Looked at another way, this means your 10 watt SSB rig will do the work of a 100 watt FM rig.

3. This is an ideal way to do 1200 bauds on 10 meters using inexpensive 10 meter SSB transceivers. Novices can use this scheme effectively and inexpensively to get on 1200 baud packet. (The little $260, 25 watt, 10 meter transceiver from Radio Shack might work very well, and the price is much less than a new 2 meter FM rig. I'll experiment with this and give you a report in a later column.)

4. Most TNCs can operate their modems as V.23 devices with little or no modification.

Most TNCs Will Support V.23

If you have a Kantronics TNC, you're in luck. Most Kantronics TNCs can operate in V.23 mode simply by entering the command CCITT ON. TNCs with the AMD7910 or the TCM3105 single chip modems can operate V.23, as control pins on the chips select the modem's operating mode. If your TNC has one of these modems, but no command to select V.23, contact the manufacturer for modification information.

By modifying the transmit modulator, TAPR TNC-1 and TNC-2 clones (those that use the 2206 modulator and 2211 demodulator) can operate in V.23. Use the standard calibration technique to set the transmit modulator to the 1300 Hz and 2100 Hz tones. The receiv-

er demodulator does not need recalibration. That's all there is to it.

You can also modify the AEA PK-232 to operate as a V.23 modem simply by readjusting the 2206 modulator. See the PK-232 manual, or contact AEA for instructions on how to do this.

Proper Passband Adjustment

There is one fly in the ointment; not all SSB radios have a passband centered at 1700 Hz. You can find out if yours does by doing a simple test using only an audio generator and a wattmeter/dummy load. Connect the audio generator to the microphone jack and the wattmeter/dummy load to the antenna jack. Set the mike gain control to its normal operating position. Set the frequency of the audio generator to about 1500 Hz and increase the signal from the audio generator until the transceiver is putting out about half power. Decrease the frequency of the audio generator until the transceiver output power drops to one-fourth of the previous power level (down by 6 dB).

The audio generator is now set to the low frequency edge of the passband. Now increase the frequency of the audio generator. The power output of the radio will rise again. Continue to increase the frequency of the audio generator until the power output again drops by 6 db (one-fourth power). The audio generator is now set to the high frequency edge of the passband. You can now determine how well the modem signal will fit into the passband.

If the modem spectrum does not fit comfortably in the passband, and your transceiver has IF shift, you are in luck; just use the IF shift to center the IF passband over the modem tones. If you do not have IF shift, you'll have to either modify the radio (change the BFO injection frequency) or use different tones.

It turns out that using different tones is not a problem. The only important thing is that the tones differ by the correct shift, in this case, 800 Hz. If you have a TNC-1, TNC-2, or other TNC that uses a 2206 modulator and a 2211 demodulator, all you have to do is readjust the 2206 to the new tone pair. Adjust the 2211 center frequency to be exactly in the middle of the new tone pair, e.g., if the tones are 1000 Hz and 1800 Hz, adjust the 2211 to a center frequency of 1400 Hz.

Please try this and let me know how things work out. I will also be experimenting to see what works and what doesn't, and I'll report back on this in a later column.

The ARRL HF Modem Project

The Federal Emergency Management Agency (FEMA) and the ARRL Technology fund have provided a total of $16,000 for HF modem experimentation. The fund will help defray the costs incurred by amateurs while they are developing and experimenting with new modem hardware.

If you are a serious experimenter interested in spending time developing and testing new modem ideas for HF packet communications, contact Lori Weinberg, 203-666-1541, at ARRL Headquarters, 225 Main Street, Newington CT 06111. ■

Number 34 on your Feedback card

UPDATES

KB1UM's Flavorig

Refer to "Flavorig!," by Michael J. Geier KB1UM, on page 12 in the November 1989 issue. The Parts List for this project is on page 88. The correct Source and No. for L6 (10 mH) is Digi-Key M70103 (NOT M7100).

Easy Tuning for the Uniden HR-2510

Also in the November 1989 issue, a connection was left out of the diagram on page 40 of the article, "Easy Tuning for the Uniden HR-2510," by Carl A. Kollar K3JML. Pins 2 and 4, and pins 8 and 12, should be jumpered together or the circuit won't work. Otherwise, the schematic, parts placement, parts list, and component mounting guide are all correct.

About Updates

If you have any questions about an article, please contact the author, whose name and address appears at the end of the article. If any changes, corrections, or additional information concerning any item in the article needs to be published, it's the author's responsibility to contact *73* and provide the editorial staff with the new information.

"Updates" is not limited to corrections. For example, if you find a better supplier of a particular part than the author, or an easier way of carrying out his instructions than he suggests, let him and us know.

Material published in "Updates" always refers to items in previous issues. ■

Number 23 on your Feedback card

73 Book Review *by Andy MacAllister WA5ZIB*

Tune in on Telephone Calls

For the casual listener and the ardent enthusiast.

Tune in on Telephone Calls
Scanner and Shortwave Frequency Directory
by Tom Kneitel K2AES
CRB Research Books, Inc.
PO Box 56
Commack NY 11725
$12.95 ($2.00 S & H)
Copyright 1988
ISBN: 0-939780-08-9

Radiotelephone signals abound from just above the AM broadcast band through the microwave spectrum. *Tune In on Telephone Calls* by Tom Kneitel K2AES delivers a detailed examination of the modes, frequencies and purposes of the many types of wireless phone systems on the air today.

Tom has been actively writing for the amateur radio enthusiast and shortwave listener for over 30 years, and he has published many books and hundreds of articles on communications topics.

Tune in on Telephone Calls is formatted as a frequency list, with detailed descriptions of each service and its location in the RF spectrum. The author also provides a few definitions of terms that might not be familiar to beginners. Unlike other guides Tom has put together over the years, which are composed almost entirely of channel listings, this radiotelephone book is more than a third text.

Communications Privacy Covered

The first chapter gives some of the history of mobile telephone use and the legalities of monitoring calls heard over the air. Unlike the ham on a 2 meter repeater, a radio-telephone user, especially a new cellular subscriber, thinks he is on a clear channel with no eavesdroppers.

Anything said over normal phone lines, from casual business operations to clandestine activities, will turn up on the radiotelephone frequencies.

Tom describes in detail the events leading up to the passage of the Electronic Communications Privacy Act. This law makes it is illegal to listen to cellular mobile telephone (CMT) services.

CMT Overview

Although the chapter dealing specifically with cellular phone operation is short, it is informative. There is complete frequency information, including system input and output frequencies with channel spacing.

If you're interested in technical details on CMT control frequencies or command formats, don't look here. The book does not go beyond the basics, but it does provide a simplified description of the cellular-radio concept in operation.

Section for SWLers

The book has a fine section on shortwave receivers and VHF/UHF scanners for monitoring radiotelephone frequencies. Tom even provides instructions for modifying the Radio Shack PRO-2004 scanner to restore its ability to receive frequencies in the 825 to 845 and 870 to 890 MHz range.

He discusses antennas and the use of receive converters for extending the frequency coverage of older scanners.

Services and Frequencies

Subsequent chapters cover twenty other types of radiotelephone services and their frequencies. From cordless phone frequencies to military aircraft VIP telephone operations, the reporting is very accurate, with a few exceptions.

Amateur VHF and UHF frequency listings, where phone autopatches are allowed, are incomplete. The section on satellite telephone calls is quite short, without any details on what it takes to listen in. Tom does, however, give information on sources the reader may pursue to ferret out more data on these services.

Tune in on Telephone Calls provides all the basic information for the casual listener to get started with radio-telephone monitoring, and many details for the ardent enthusiast. This book is recommended reading for both. ■

Andy MacAllister WA5ZIB is 73's Hamsats columnist. You may write him at 14714 Knightsway Drive, Houston TX 77083.

HOMING IN

Radio Direction Finding

Joe Moell PE KØOV
PO Box 2508
Fullerton CA 92633

Mail Call

From the response I receive to "Homing In," I know that fox-hunting fun is part of the activities of many ham clubs worldwide. Kathy Allison KA1RWY of the Middlesex Amateur Radio Society of Portland, Connecticut, writes, "T-hunts have helped bring our radio club closer together." Jon Van Allen WB7OWL of West Jordan, Utah, says, "I want to see more T-hunts in Utah. I can't have any more fun without going to jail!"

I'm always interested to hear how different groups set up their RDF contests. Hunt rules around the country are varied and innovative. Some clubs hunt on repeater inputs, others use simplex channels. There are time hunts and mileage hunts, foot hunts and mobile hunts, beginner hunts and advanced hunts.

To learn more about T-hunting practices across the country, I started sending a survey form to column respondents some months ago. Several surveys have come back, and they are great reading. I'd like to know about hunts in your area, too. Please drop a line and let me know who, as a knowledgeable hunt leader, can best answer the survey questions (You, perhaps?)

Both large and small clubs are catching T-hunt fever. For example, the Lakes Area Amateur Radio Association of Bolivar, Missouri, holds a weekly hunt on 146.52 MHz. Gary Harrison WAØRWS says the hunt starts in the parking lot of a local market on Sunday at 2 PM. The hider transmits 10 seconds out of each minute. According to my almanac, Polk County (the hunt boundary area) has a population of less than 20,000, so having a well-attended weekly hunt there is quite an accomplishment.

First the T, then Tea

Foxhunting is a worldwide ham radio sport. Over in England, Richard Morrall G8ZHA reports on 2 meter hunts in Walsall, near Birmingham. Doppler RDF units are popular there.

The majority of G-land hunts, however, use 160 and 80 meters, as they have for many years. Participants build various kinds of loops and ferrite rod antennas for foot and vehicle pursuit.

A well-established schedule of regional and national championship RDF contests takes place yearly in England. Hunts on low frequency bands mean long hiding antennas. Sometimes the hiders carry this to extremes, and the competitors find themselves inside the antenna system.

A good example is the two-transmitter event held last spring at Banbury, about 65 miles northwest of London. The first transmitter was 8.7 miles northeast of the start point in a thorny hedge near one bank of a deep, water-filled drainage ditch. The antenna was a 300-foot wire along both banks. This made it very difficult for the hunters to figure out which side of the ditch to search for the transmitter location.

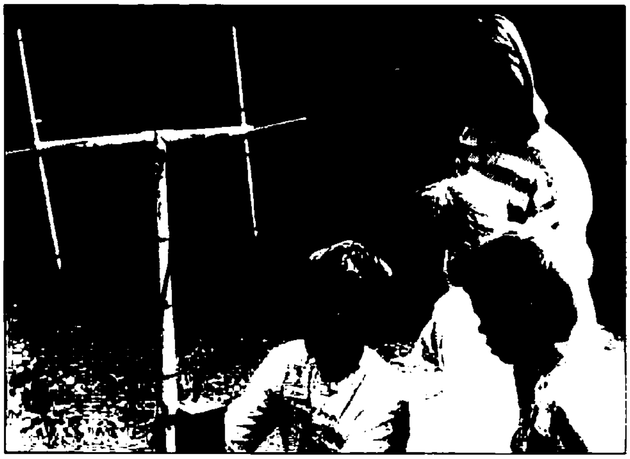


Photo A. Foxhunting fascinates kids. Christie Holoubek KØIU demonstrates the art of sniffing at a Youth Science Center event.

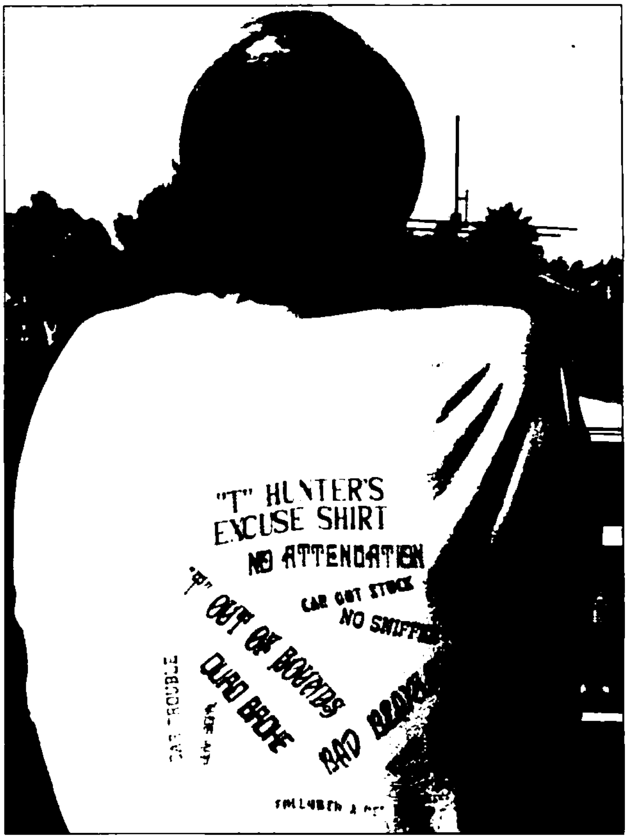


Photo B. When you don't win the hunt, you need a good excuse. J. Scott Bovitz N6MI is modeling the T-hunter's Excuse Shirt.

The second transmitter was 8.4 miles away from the start in the opposite direction. It was in a very large thorn bush next to a stream. The only way hunters could get to the transmitter was to pick their way through a swamp, and then jump the stream. The hiders strung 400 feet of antenna wire across a nearby valley, zig-zagged back and forth to saturate that area with signal.

Child's Play

I can hear some of you saying that T-hunters are just adults who never stopped playing hide-and-seek. Could be. But that also means kids will get a big charge out of playing hide-and-seek with radio gear. Hey, that's another way to interest kids in ham radio! It works, too.

The Fullerton Radio Club put a hidden 2 meter transmitter on the grounds of the local Youth Science Center's annual Hobby Fair (see Photo A). Kids of all ages got to ferret it out with a variety of gear, from simple shielded HTs to commercial homing units. They loved it, and several came back later, bringing their friends.

Giga-Hunts Next?

Some clubs find that there is not enough interest to support monthly hunts with the same set of rules. When that happens, try some special event hunts. Dave Knight KA1DT reports that the 200-member Nashua Area Amateur Radio Club of New Hampshire has gotten about 15 teams to participate in each of its half-dozen 2 meter "Super-Hunts."

Every Super-Hunt has different rules. The first one featured two foxes. One used a beam pointing into a metal building for lots of reflections. The second was 3.5 miles away from the first, at a picnic area for post-hunt refreshments. Transmitters came on only when a hunter made a request.

The second Super-Hunt was a walking-only hunt, held in a large park. The transmitter, concealed in a metal 50-caliber ammo box, was so low-powered that it could not be detected at the starting point, requiring a bit of hiking just to be able to hear the signal. This

Homing In

Continued from page 62

brought an element of chance into the hunt, giving less experienced hunters an opportunity to beat the "old hands."

A picnic or other social event follows each Super-Hunt. Sponsors make sure that a program on RDF techniques is presented at the club meeting before each Super-Hunt, to help generate interest and encourage beginners. They show sophisticated setups, but they also demonstrate how to sniff out the bunny on foot with nothing more than a handie-talkie wrapped in aluminum foil. Nonhams and almost-hams sometimes come out to hunt, too.

I'm going to give the foil-wrap idea a try. It should work fine for hand-held sniffing, provided that the transmitter is running very low power. (KA1DT used a 50 microwatt rig on one hunt.) The Nashua hunters make simple variable attenuators for this system by sliding the foil shield up and down the HT's rubber duckie. Don't short out your battery pack!

An award ceremony with simple prizes caps off each Super-Hunt. There's even an "8-ball Award," given with tongue in cheek to the hunter who strays farthest in his pursuit of the foxes.

Poker on the Green

The Victor Valley Amateur Radio Club knows the value of special event hunts, too. Walt Brackmann WA6SJA told me about VVARC's first "Mega-Hunt" and *Poker Run* last November, featuring five transmitters spaced over an area of 335 square miles. It was slow going because each transmitter came on for only 30 seconds every 10 minutes. When a hunter found a transmitter, he received an envelope containing a playing card and a clue. On the outside of the envelope was the frequency of the next transmitter.

Hunters were to leave their envelopes unopened for the poker hand contest at the end of the hunt, but if they got stuck, they could open the envelope and read the clue. Opening the envelope meant forfeiting the points for that transmitter, but the clue would help the hunter stay in the poker hand competition.

Hunters from as far away as Los Angeles county came to participate in the first Mega-Hunt. Victorville and the rest of the Victor Valley is a high growth area in the California desert. Ham radio activity is mushrooming there, and I hope there will be more Mega-Hunts.

California Commandos

The greater Los Angeles area continues to lead the nation in T-hunt activity. There are 14 regularly scheduled hunts each month, with starting points from Santa Barbara to Escondido. Every month there is some type of "All Day" or "All Night" hunt, with no boundaries and almost no rules.

J. Scott Bovitz N6MI (see Photo B) and Milt Ronney WA6FAT set a new distance record last July when they hid the 2 meter All-Day hunt transmitter on top of 8351-foot Shuteye Peak in the Sierra National Forest.

Their Madera County location was 252 air miles from the Rancho Palos Verdes starting point. Only two of the eleven starting teams found Scott and Ron without assistance. The winning team, Clarke Harris WB6ADC and Jensen Woods WB6ZFU, got there in 24 hours with 423 elapsed miles.

T-Hunting Hazard

Hunts normally go smoothly in laid-back southern California, but occasionally there are big surprises. Miles Abernathy N5KOB passes on this item from the Circle City Communicator, the newsletter of the Corona-Norco Amateur Radio Club:

"N6SBU was stopped along the way to take a bearing on the hidden T, when much to his amazement, a big, ugly homeowner came out to John's car, grabbed his T-hunting quad, and said, 'You get out of here! If you come back, I'll kill you!' In his rapid escape, N6SBU lost his quad, but once his pulse rate dropped from 345 to about 150, he continued the hunt with just his ⅝-wave whip. To his credit, he found hider W6TKV first (best time, but not winning mileage). Now that's a dedicated T-hunter!"

Oops, I'm out of space for this month. Too bad, because there's lots more to tell about amateur radio transmitter hunting. I hope you have gotten some good ideas for hunts in your area.

Thanks to everyone who has provided information for this month's column. I welcome your cards, letters, and T-hunt photos. It's also fun to get club bulletins containing T-hunt reports. Let's show everyone that the *fun* of T-hunting is the best kept secret in ham radio, but let's not keep it a secret. 73

Continued from page 30
ance was markedly better than with the radio and whip. The tripod added just one extra pound of weight to the hike up the hill.

Accessories

This radio has jacks to connect an external speaker and an electret microphone with push-to-talk switching. There is also an internal noise blanker. I tested it, and it was very effective on ignition noise. Additionally, the receiver has a switch that can be controlled externally to reduce the sensitivity on very strong signals.

On difficult contacts, the radio can be switched to CW. If you didn't bring a key you can use the momentary CW key switch on the top of the radio for CW operation. The PTT switch has to be continuously depressed when using the built-in CW switch. (Switch from SSB to CW on the bottom of the radio.)

To change to another frequency range you must replace the VXO crystal. The AEA manual states that crystals cost $15 each; contact them for details. I determined that the crystal frequency was 12.95883 MHz for 50.150, or channel "A," operation, and 12.99216 MHz for channel "B" operation on 50.250 MHz. The 12 MHz crystal frequency is tripled to the 38 MHz range for injection into the mixer. To determine crystal frequencies use the following formula: Frequency operation (high side) minus IF Frequency (11.2735 MHz), divided by 3 equals the crystal frequency. The VXO circuitry pulls the crystal lower in frequency for the 50 kHz band coverage per crystal.

Grumbles

I have a few recommendations to improve the unit. Make the PTT larger, so your thumb can find it faster, and keep it depressed comfortably for longer periods (since its spring resistance would be spread out over a larger base). Also, consolidate the controls on the same panel, or at least move them and the power jack off the bottom panel so you can place the unit upright. Another solution is to include an antenna with a swivel joint located near the connector, so you can lay the unit on its back panel. Finally, make available a 120 VAC/12 VDC to 9 VDC supply matched to the unit.

Tests

The receiver sensitivity, measured at 0.2μ, far exceeds the specified 0.5 microvolts, and the power output was 1 Watt RMS (almost 2 W PEP) on SSB.

Conclusion

I enjoyed using the MX-6S SSB and recommend it to anyone interested in working this fascinating band. It's not just a monitor to watch for six meter openings, but also a full SSB transceiver to use on those openings you might otherwise miss. AEA had a good idea in providing this SSB HT to a market that is short on SSB handhelds! 73

C. L. Houghton WB6IGP writes 73's "Above and Beyond" column. Contact him c/o the San Diego Microwave Group, 6345 Badger Lake, San Diego CA 92119.

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So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

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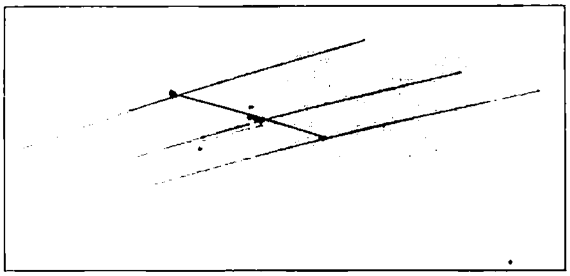

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The Ten-3 is available from amateur radio dealers worldwide. List price: $125. Contact *Cushcraft Corporation, P.O. Box 4680, 48 Perimeter Rd., Manchester NH 03108. (603) 627-7877.* Or circle Reader Service No. 201.

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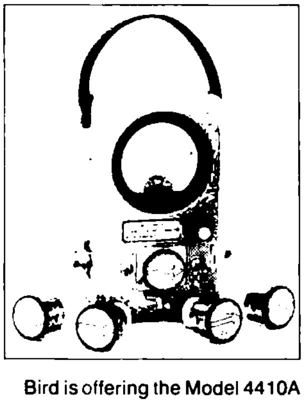

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Price of the 4410A is $545. Presently, the 30 optional Plug-In accessories range from $140–$190 each. For more information, contact *Bird Electronic Corporation, 30303 Aurora Road, Cleveland (Solon) OH 44139-2794. (216) 248-1200.* Or circle Reader Service No. 202.

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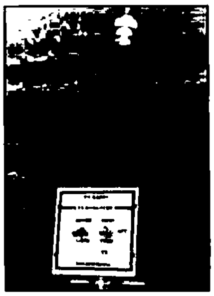


The TX Enhancer, for use with Kenwood and ICOM transceivers, is a small, shielded box that plugs in between the microphone and the mike jack on your radio. The box contains a status LED and a two-position center-off switch for AM, FM and SSB operation on HF, VHF and UHF radios. One position keys up your transmitter and injects a short duty-pulsed tone into the mike audio. This provides a pulsed drive in SSB for safe, "no rush" tuning of your linear amplifier while allowing more accurate tune-up than you can set by tuning up in the CW mode with a reduced carrier. Each pulse will provide 100% peak output, but the average output will be approximately 25%.

The other position provides a short beep transmitted at the end of each of your transmissions, telling the station you're in contact with that it's his turn to talk. Usable in the PTT mode (and VOX mode with almost all ICOM and most Kenwood models), it is especially useful in roundtables or just plain rag-chewing.

The TX Enhancer needs one battery, which is supplied. The price is $62. Specify the version when ordering: K8-200 works with all Kenwood models that have an 8-pin mike jack; I8-346 works with ICOMs that have an 8-pin mike jack. Add $5 shipping and handling for USA and Canada; $13 elsewhere. Contact *International Radio and Computers, Inc., 751 S. Macedo Blvd., Port St. Lucie FL 34983. (407) 879-6868.* Or circle Reader Service No. 203.

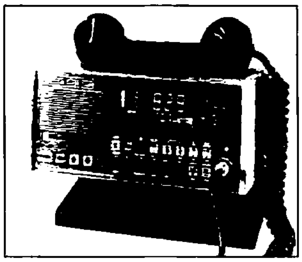
NEMAL ELECTRONICS

Nemal Electronics International has introduced a series of new precision video and audio cables for broadcast, video and RF applications. Both cables comply with the new National Electrical Code requirements, and carry the "CL2" rating.

Nemal part no. 1570 is a precision video coax, similar in size to RG-59/U, offering excellent shielding, low loss (0.7 dB per 100 ft. at 10 MHz), flexibility and low cost ($235 per 1,000 ft.). Nemal part no. 2201A is a one-pair 22 GA cable with foil shielding and drain wire featuring reduced diameter (0.135"), crush resistant construction, and single strip removal of both jacket and foil. The audio cable is available in 7 colors, and in multiple pair counts up to 32 pair, for $79 per 1,000 ft.

Both cables are available either in bulk or pre-terminated, and either on spools or in pull-out boxes. Contact *Nemal Electronics International, Inc., at (914) 359-3333 or FAX (914) 359-3607.* Or circle Reader Service No. 204.

SGC INC.



The Model SG-2000 from SGC, Inc., is a high frequency, single sideband radiotelephone that provides global HF communications on voice and data transmission. It features several sophisticated scanning modes, has a large LCD frequency display, and is remote and ARQ/FEC ready. It also has a splash-proof front panel, an internal clock with turn on/off programming, 616 ITU voice and data channels, and 100 user-programmable memory channels.

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Designed as a product for the '90s, the SG-2000 will operate on any marine, commercial and ham frequencies, and has receive capabilities for broadcast and WEATHERFAX frequencies. It retails for $1,995; additional remote heads are $595 each. Contact *SGC, Inc., Sales and Marketing Department, SGC Building, 13737 S.E. 26th St., Bellevue WA 98005. (206) 746-6310.* Or circle Reader Service No. 205.

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S. Burlington VT 05406

Setting Up Shop

In previous columns, I've discussed various aspects of equipment repair. Hopefully, I've whetted your appetite enough that you've at least contemplated fixing your own gear the next time it breaks. If you already have an equipped workspace, great! If not, you may consider the prospect of setting one up to be daunting, even intimidating, and perhaps too great an obstacle to overcome. Well, it doesn't have to be! In fact, setting up shop can be fun, and even fairly inexpensive.

Choosing Your Space

The first thing you need, of course, is some place to work. This can range from a desk in the corner of a den to an entire room or basement. Obviously, the bigger the better. But size alone doesn't guarantee a successful workshop. Organization and careful selection and placement of equipment are far more important.

If you have a choice, select a workspace that is quiet and isolated. Electronics work demands concentration, and a noisy living room, with the kids running around and the TV on, just won't do. Not only is such an environment counterproductive, it can be downright dangerous. Deadly high voltages are present in many kinds of equipment, and the slip of a test probe, or a distracted finger, can result in disasters ranging from blown transistors and ICs, to fire or even electrocution. Also, many repairs require leaving equipment open overnight, and family members, especially little children, may inadvertantly damage it, lose the screws, or be injured by it. If you have young kids or pets, use some means, such as a lock on the door, to make sure they can't get to your work area when you're not there.

Furnishing Your Space

It is best if the room is not carpeted. Tiny parts and screws may disappear instantaneously when dropped into carpeting. Although they bounce on a hard floor, and can wind up far from where you dropped them, at least you have a *chance* of finding them! If you must work in a carpeted area, get an old, light-colored, shallow pile carpet scrap and put it directly under your chair, to catch solder drippings and such. Service can be a remarkably messy business, and it's easy to ruin a good carpet. Also, the shallow pile and light color help avoid the twilight zone lost-screw effect.

Once you've selected your workspace, it's time to pick a table on which to work. Try to get the biggest one you can, with shelves if possible. The shelves let you place your large test equipment at eye level, and tremendously increase your effective work area, because they leave the table free for the equipment on which you're working.

The table should be at a comfortable height, so you won't have a sore back after spending a few hours tracking down that elusive intermittent. For the same reason, the chair should be selected with long sitting periods in mind. An office chair, with wheels or rollers, is best. Avoid fold-up kitchen chairs. The discomfort you'll endure after spending an entire evening in one of those will leave you reluctant to do it again.

Have You Got a Light?

Good lighting is essential. In addition to fairly bright overhead room lighting, you should get a lamp on a swing arm and mount it to a corner of your table. These lights come in two varieties: incandescent and fluorescent. The fluorescent ones usually have a circular tube with a big magnifier in the middle, through which you can view your work. They cost about $80, but get one if you can afford it.

The incandescent lamps only cost about $20, but they get very hot and it can be uncomfortable working with one over your head. Also, they usually have no magnifier. In today's world of microminiature circuits, the lens is very helpful. Finally, get a small, powerful flashlight. For seeing into the dark corners of some chassis, sometimes there's just no substitute.

Basic Tools

You'll need some basic hand tools. Get an assortment of screwdrivers, a pair of needlenose pliers, and a pair of diagonal cutters. Forceps are also very handy. Although some medium size pliers and screwdrivers are required, most of your tools should be small, in keeping with the scale of modern electronics. You can find such tools at your local Radio Shack or hardware store.

You'll also need some chemicals. Tuner cleaner (useful for switches, relays, etc.), isopropyl alcohol and compressed air are especially handy. A tube of super-type glue and a bottle of nail polish remover (which also removes the glue), some light machine oil, and a tube of lubing gel complete the basic chemicals collection.

> ***". . . today's tiny surface mount parts are soldered in much the same way as were the parts hanging off tube sockets in our grandparents' generation."***

Some Like it Hot

The backbone of any repair or construction job is, of course, soldering. This connection method has changed little over the entire history of electronics; today's tiny surface mount parts are soldered in much the same way as were the parts hanging off tube sockets in our grandparents' generation. The primary difference is the amount of heat used.

Most modern parts should be soldered using an iron of no more than 30 watts or so. The most convenient and comfortable iron is the kind with a cord leading to a separate stand. Some have an adjustable heat control. If you intend to work with ICs, it is wise to consider an iron with a 3-wire AC plug and a grounded tip, to bypass static charge problems. Avoid the $4.95 pencil types, because they usually don't last very long, and their handles get rather hot. Of all your equipment, you'll use your soldering iron the most, so get one you like.

In addition, it is wise to have a 100–150 watt gun. You can't do some jobs, like PL-259 coax plug wiring, with the small iron; there just isn't enough heat. The guns are usually no more than $20, and well worth it.

Your solder should be 60% tin, 40% lead, and rosin core, which is the kind normally sold by all electronics suppliers. It comes in various diameters, and I recommend using the smallest one you can get. Larger sizes make close work on small boards difficult. Try to buy a one-pound spool, for cost savings. You'll eventually use it all, anyway. Nothing is more frustrating than running out of solder in the middle of a project on a Sunday night. Also, get some wick-type solder remover. This stuff drinks up solder from a connection, making part removal easy. Especially with ICs, it often makes the difference between easy work and a ruined PC board. It comes on small spools at modest cost. Get two.

Testing, Testing

The most influential factor in choosing test gear is your budget. If you can afford spectrum analyzers and computerized signal analysis equipment (and know how to use it), by all means go and get it. If you're like most of us, though, such things are merely dreams. So, where should we begin?

Get a decent analog voltmeter (VOM). Expect to pay $30–$60 for it. A digital meter is also nice, and they have become fairly inexpensive in the last few years. Don't bother to pay for laboratory accuracy unless you really need it, which is unlikely.

If at all possible, get an oscilloscope. There are some decent ones available new for about $350, and used ones abound, too. There is nothing, I repeat nothing, more useful than a scope. If you don't know how to use one, get a book and learn; it isn't hard. Also, see my last column in the January 1990 issue of *73* regarding scopes.

A DC power supply is necessary when working on mobile or portable gear. A variable unit with a few amps current capacity should handle most jobs. High-powered transceivers may require a much bigge. supply, but unless you intend to work with lots of

them, the cost may not be justified. Consider building your own power supply from a published schematic. With today's IC voltage regulators, it's easy, and can save you quite a bit.

If you've got any money left, consider a frequency counter, particularly if you're going to work with radio gear. The upper counting frequency and the cost generally rise together, but try to get one that will cover the frequencies you are likely to encounter. A 30 MHz counter won't do you much good if you're primarily a VHFer, but it's fine for most HF work.

Other test devices, such as capacitance meters, dip meters, signal generators and transistor testers, are handy but may be dispensable, depending on the kind of work you do. You may be able to borrow a seldom-used instrument. Also, some of them can be homebrewed, and they make nice winter projects. And, of course, you can

from weeks of frustrating waiting.

You'll also need data books. You should have a transistor substitution guide, and books for common CMOS, TTL and linear ICs. Just knowing the pinout of a suspected IC can save you hours of troubleshooting. (Of course, you're supposed to have the schematic for anything you fix, but that's another subject . . .)

Some books may be in your local bookstore, others you may have to order. Often, people will sell or even give you their old ones when they update.

Next time you're at a hamfest, look for parts bargains, junked machines and last year's data books. Often, you can grab a handful of, say, capacitors for $1 that would cost $10 in the store. Or you can buy a wrecked chassis for 50 cents that will yield $50 in parts, some of them hard to get at any price. All in all, hamfests are probably the best place to look to stock your larder.

". . . select a workspace that is quiet and isolated."

always pick them up along the way, as your need for them arises.

Parts is Parts

Get some storage cabinets and fill them with a variety of common components. Label the drawers, and be sure to leave a few empty so you can use them to store the screws from jobs in progress. You should have all the standard resistor values from 10Ω to 1 megohm (¼ watt or ½ watt is fine), disc capacitors up to 0.1 µf, and electrolytic caps up to 250 µf. If you plan to homebrew, also get diodes, common transistors (such as 2N2222, 2N3904, 2N3906, etc.), and some CMOS gates (4001, 4011).

You'll find that no matter how many parts you have, you never have the one you need! Many times, you'll have to buy or order parts in the middle of a job. Especially with Japanese gear, there's just no way around it. Still, the more you have on hand, the better. I keep a pile of PC boards from junked VCRs, CB radios, etc., and pull parts as needed. I can't count the number of times they have saved me

Putting it all Together

A careful arrangement of your gear and parts will help maximize their usefulness and convenience. There are lots of possibilities, and no right or wrong ways to do it. I keep my soldering iron at table (not shelf) level, off to one side but within arm's reach. My parts cabinets line the back of the table. Small test equipment, such as the frequency counter and power supply, is also at table level, as are small hand tools. On the shelf are the scope, meters, larger tools, and some parts overflow (I've been at this a long time!). Any instruments with displays should be placed for easy reading. I angle the scope so that it points directly at me.

Plug all or most of your AC operated gear into a switched outlet strip, and mount it within reach, so that you can hit the switch in a hurry. Always use it when testing an AC operated repair job, for the same reason. Finally, round out your lab with a vital, but often overlooked, item: a fire extinguisher. You'll probably never use it, but you never know. And it can be a life saver. ■

73 INTERNATIONAL

edited by C.C.C.

Notes from FN42

WOW! As the lyrics of a song popular in my earlier days said: "Oh the times they are achanging." Something that many of us felt would never happen has happened. The complete opening of the borders between East and West Berlin, the free flow of citizens between the German Democratic Republic and the Federal Republic of Germany, has happened!

This event should certainly not override other events of the day, week, month, or year (such as the changes in Poland, the free elections in Namibia, the changes in Bulgaria, and many others) yet it does seem to get the most attention in the U.S. news media. But news is news, and we on this Earth should be very thankful that we have means of rapid communication and joyful communications that herald the reuniting of families and friends after years of separation.

Hopefully the leaders of the many countries that are reopening their borders and those leaders allowing their citizens to take part in governing their country's affairs have finally realized what we hams have known for years, that communicating with each other, listening to each other's ideas, and helping each other makes sense, and can go a long way towards solving the world's problems.

Oh, what a joy it is to live in this time and dream of our future, a future that appears to be getting better and better, not just year-to-year, but day-by-day!

It is not too often that you open your local paper (at least not mine) and find a story from the Associated Press (AP) about a ham. I was very surprised and happy to read an article about 9N1MM, Rev. Marshall D. Moran, an 83-year-old Chicago-born Jesuit priest, the only ham operator in Nepal. Most of the article was about people he had met, such as Mahatma Ghandi and Jawaharlal Nehru, but there was certainly enough to help promote the cause of ham radio. He estimates to the reporter that he has talked to over 80,000 ham operators.

I certainly do not mean or wish to belittle Rev. Moran but the word "talked" caught my eye. How often do we "talk" to another ham, receive the normal "59" or "599" and then go about our business of getting another rare one? How long has it been since you really "talked" to another ham for more than one minute? Do we really "talk" or "communicate"?

According to one of my trusty dictionaries I find: "talk: to deliver or express in speech; to use (a language) for conversing or communicating; to express or exchange ideas by means of spoken words"; "Communicate: an exchange of information; a technique for expressing ideas effectively." Something common to both is the word "idea." "Idea: a formulated thought or opinion."

I will let you formulate your own thoughts as to whether we truly communicate. Our world is changing, sometimes more rapidly than some might wish. Countries are opening borders that have been closed for many years. These borders include the physical as well as the communicative. What we need to remember is that there are many hams around the world with many ideas to convey. Let's say something more than just "59, QSL via the Bureau." Let's really "communicate."

—Arnie N1BAC

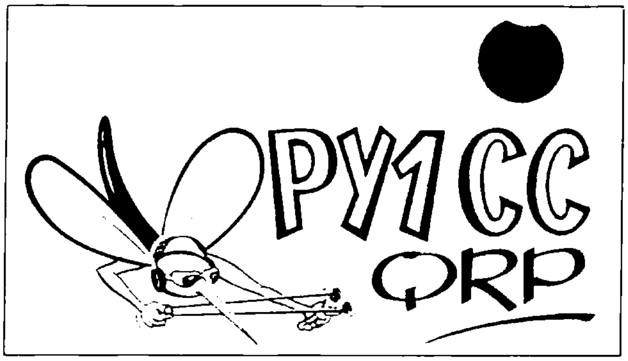

Photo A. QRP QSL card of Carlos PY1CC, a 73 Hambassador from Brazil.

ROUNDUP

Japan From the JARL News: According to the bulletin issued by the Ministry of Posts and Telecommunications, the number of radio stations licensed in accordance with the regulations of Radio Law, reached 5,107,175 as of June 30th, 1989 in Japan. When radio stations are classified, the number of Conventional Radio Stations (Citizen Band Radio, etc.) are 2,390,000, that of Portable Radio Stations (Automobile Radio, Multi Channel Access Radio, etc.) come to 1,540,000 and these are followed by Amateur Radio Stations, 950,000 (18.6% of total). All three kinds of stations are 93.5% of the total Radio Stations.

Sweden From Radio Sweden Bulletin:

PUBLICATIONS: Edition 4.2 of Radio Sweden's *Communications in Space: The DXers Guide to the Galaxy* is now available free of charge from Radio Sweden. This 13-page publication covers satellite radio and television, weather and other "utility" utility satellites, amateur radio in space, and the American and Soviet space programs. [*Radio Sweden, S-105 10 Stockholm, Sweden*]

They are still updating their book *The DXers Guide to Computing* and edition 4 is still several months away. However, due to popular demand, they reprinted the most recent edition, 3.0, in one volume including all updates 3.1 to 3.6. Note that this reprint contains exactly the same information as in the previous edition and updates. It's available from Radio Sweden for USD 3, GBP 2, SEK or FF 20, or 7 IRCs or DM. Please DO NOT send orders for the forthcoming edition 4, as it is still in preparation (George Wood).

Radio Sweden sends out Sweden Calling DXers bulletins every four weeks. Listeners who send in media news go on the mailing list for one year. News can be sent to

Calendar for February

1—St. Bridget's Day, Ireland
2—Groundhog Day, USA
3—Felix Mendelssohn, 1809; Gertrude Stein, 1874; St. Bias, Paraguay
4—Independence Day, Sri Lanka
5—Anniversary of the Constitution, Mexico
6—New Zealand Day
7—Independence Day, Grenada
8—1963 Revolution Day, Iraq
9—Soseki Natsume, 1867; St. Marion's Day, Lebanon
10—St. Paul Day, Malta; Lantern Festival, China
11—National Holiday, Iran; Commemoration of the Founding of the Nation, Japan; Thomas Alva Edison, 1847; Youth Day, Cameroon
12—Lincoln's Birthday, USA
14—Valentine's Day, Race Relations Day, USA
15—Nirvana Day, Buddhist; Susan B. Anthony, USA
18—Democracy Day, Nepal; Independence Day, Gambia; Start of Brotherhood Week, USA
19—President's Day, USA
20—Toshiro Mayuzumi, 1929
21—Robert Gabriel Mugabe, 1924
22—Frederic Chopin, 1810; Independence Day, St. Lucia; Washington's Birthday, USA
23—Isra and Miraj; Georg Friedrich Handel, 1685; National Day, Guyana; National Day, Brunei; Shivarati, Hindu
25—National Holiday, Kuwait; Victory Day, Czechoslovakia
26—Intercalary Days, Bahai; First Day of Lent, Eastern Orthodox
27—Independence Day, Dominican Republic; Shrove Tuesday, Mardi Gras
28—Kalevala Day, Finland; Ash Wednesday

Data for the monthly calendar comes from The 1990 World Calendar published by Educational Extension Systems, PO Box 259, Clarks Summit, PA 18411, Copyright 1989 by P.R. Fischetti, and other sources.

George Wood at Swedish telex 11738, Telefax +46-8-667-6283, to CompuServe (Easyplex 70247, 3516), through the FidoNet system to 2:202/297 or to SM0IIN on the packet radio BBS SK0TM. An Electronic Edition is carried on the CompuServe HamNet Forum, the Pinelands BBS, and other telephone-based and packet radio computer bulletin boards.

Switzerland From the International Telecommunication Union (ITU) Press Release:

ITU-COM 89, the first world summit on the electronic media, started on 3 October and finished 8 October 1989 in the presence of 445 Ministers, Ambassadors, Directors-General of broadcasting, business and industry leaders from 123 countries.

Held under the general theme "Towards global information: the electronic media explosion," ITU-COM 89 aimed to draw attention to the growing importance of the electronic media in everyday life and the dynamic growth of the sector.

ITU-COM 89 was essentially a symposium in three parts (policy, technical and legal), combined with an exhibition displaying some of the applications discussed at the symposium: electronic communication applications, digital audio broadcasting, direct satellite broadcasting, high-definition television, cable networks . . . [*It appears that most, if not all, of the topics have some sort of relationship with ham radio. Looks like a few fun years coming for those who like experimenting.—C.C.C.*]

NEW ZEALAND
Des Chapman ZL2VR
459 Kennedy Road
Napier, New Zealand

New Zealand 1990

New Zealand Sesqui-Centennial

1990 is New Zealand's 150th Anniversary year . . . and the NZART Branches and members have some special events planned to help commemorate the anniversary:

1. The use of the special prefix ZM is presently in operation—its use was authorized from 1st June, 1989 through 31st December, 1990.

2. Scout Jamboree, Hamilton, January 4th–11th, 1990 with a special callsign, ZM1JAM. [*Hopefully some of you had a chance to contact this special station. Info came in too late to include in the January 1990 issue.—C.C.C.*]

3. To celebrate the 150th anniversary of Wellington, ZM6A will operate [*operated?*] from the Wellington Civic Chambers on January 22, 1990.

4. The Northland Branches of NZART plan to have a station ZM1VLA operating at Awanui from February 10th to the 28th, 1990, to commemorate the 60th anniversary of the closing of the last New Zealand Spark Transmitting Station (VLA).

5. The XIV Commonwealth Games Station ZM14CG will be on the air from June 1st, 1989, to February 10th, 1990. A special QSL card and an award are available.

6. A special letter postmark will be used by NZART HQ during 1990.

7. The Marton '90 Award—a "freebie" . . . Marton Branch 23's contribution to the New Zealand sesqui-centennial is a special award that will operate between January 15th and 29th, 1990. ZL2VS (Branch President, Dusty) will be operating from Waitangi, Chatham Islands, under the special callsign ZM7VS on all HF bands during that period. The Marton Branch station, ZM2AMS, will operate on all bands HF-UHF during the same period. REQUIREMENTS: Work both stations, any band, any mode . . . details of both contacts required. Listener participation invited. The award is free . . . just send an SASE or return postage (US$1 approx. for the Americas and Canada) for QSL-card-size award to ZL2IG, E.P. Tombs, Ihakara, R.D.1, Levin, 5500, New Zealand.

8. VK-ZL-OCEANIA Contest, October 1990 . . . Planning is under way to make this contest a truly international VK-ZL-Oceania Contest for 1990 with specially produced Awards and Certificates. Still in the planning stages, but more information will be supplied when details are finalized and confirmed.

9. The XIV Commonwealth Games Award . . . sponsored by the New Zealand Association of Radio Transmitters, Inc. This award is available to radio amateurs worldwide between June 1st, 1989, and February 10th, 1990.

To qualify for the Award, radio amateurs must contact 5 ZM1 stations . . . one (1) each of ZM2, ZM2, and ZM4 stations, PLUS one Commonwealth country in Regions I, II, and III, a total of 11 contacts.

The log must be verified by two other amateurs and sent to: The Awards Manager, Aola Johnston, ZL1ALE, 63 Red Hill Road, Papakura, 1703, New Zealand. Please send return postage, approx. US$1 for Americas and Canada.

Good News for NZ Travellers

From the NZ Radio Frequency Service, our regulatory body, comes the news that forthwith, licensed amateurs visiting New Zealand may use VHF/UHF handhelds on frequencies 144 MHz and above, operating for a period of not more than four (4) weeks without any application or charges being made.

The visiting amateur **MUST** be the holder of a current license issued by their own administration, and **MUST** carry a copy of the current license while operating to be made available for inspection on request.

Usage of the apparatus must conform with the requirements of New Zealand Radio Regulations 1987 and the general terms and conditions shown on the amateur license schedule. The visiting amateur must use the "home" callsign suffixed by ZL1, 2, 3, 4, as appropriate.

This is a very welcome change for our short-term visitors from overseas administrations.

[*This certainly seems to conform with a few other countries that are doing the same thing. Maybe we can dare hope that all the countries on our Earth will do the same thing in time.*

—C.C.C.]

continued on page 82

Photo B. U 1000000 C, USSR 1,000,000 Cities Award from the West Siberia DX Club, sent by UA9MA. We've saved the "Best for the Last" next month. Don't miss it!

ATV

Ham Television

Bill Brown WB8ELK
Elktronics
12536 T.R. 77
Findlay OH 45840

Bored with Network TV?

Tune in to some real entertainment with Amateur Television (ATV)! If you own a TV set and video camera or camcorder, you have the basic ingredients to start your own ATV station.

Getting Started

Now that commercially built ATV transceivers and antennas are available, you no longer need to be a technical wizard to become active on ATV. P.C. Electronics, Wyman Research and AEA all make a complete line of ATV transceivers and associated equipment. Just hook up your TV set, camera, and 70cm antenna, and you're ready to join in the fun.

Since ATV transmissions are allowed only on the 70cm band and above, for best results you should give special consideration to your antenna system. Put up the best antenna you can find, above treetop level, if possible. Some of the more popular antennas are the Jaybeam, KLM series, the K1FO, and home-built Quagis or Collinears. At these frequencies, feedline loss can be one of the most important factors. A cheap grade of RG-8 coax can turn your high gain antenna into a dummy load. Use 9913 coax or hardline whenever possible.

With a 50 watt transmitter and a good antenna system, your local range should be between 30 and 60 miles, depending on the surrounding terrain. Under the right conditions, you can extend your range tremendously.

A good tropo or duct has been responsible for many contacts over several-hundred mile paths. Last March W5VDS and WA4GRK established the US record across the Gulf of Mexico (over 937 miles) on the 1200 MHz ATV band. One hundred mile or more contacts are possible just by taking advantage of early morning and late night band enhancements, particularly during the summer months.

Mountain-topping can be a quick way to create your own band openings. K4SAO and KC4CTW set up last summer on top of 6300' Roan Mountain in North Carolina, and they were rewarded with several 300 mile ATV contacts!

Photo A. Bob N8IYD designed a servo-operated mirror system to provide us with a spectacular view of the ground below.

Aeronautical mobile contacts can really produce some amazing results. Mel KA8LWR has made numerous 140-mile contacts from his Cessna at 10,000 feet, while allowing us all to fly along with him from the comfort of our hamshacks.

ATV Balloon to the Edge of Space

During the past two years, we launched from sites across the country a series of helium balloons carrying ATV transmitters. These balloons usually go beyond 100,000 feet in altitude before bursting and parachuting the payload to Earth. With just 1 watt to an omni-directional antenna, the ATV signal has been received over 400 miles away, covering a 10 state area!

Photo B. ATV transmission received by W9ZIH and WB0ZJP at 150 miles.

On October 7, 1989, KA9SZX and and I launched the latest of these from Champaign, Illinois. Bob N8IYD designed a servo-operated mirror system to provide us with a spectacular view of the ground below, as well as views of the horizon showing the Earth's curvature from the onboard B/W TV camera. We're planning several flights in the spring and summer—keep a lookout for dates, times, and places here.

All you need to view these balloon flights and local ATV QSOs is a 70cm antenna system! If you have no ATV equipment, just hook your antenna up to a cable-ready TV or VCR. It turns out that cable channel 60 is on 439.25 MHz (Note: this is not UHF channel 60; you have to switch your TV or VCR to the cable channel position). You can view other popular 70cm ATV frequencies on either cable channel 57, 58 or 59.

Go Fly a Kite!

Jon Pifer WM8W of Arlington, Ohio, came up with a unique way of raising his antenna height. He built a mammoth 16-foot Delta Wing kite to take his 1 watt ATV transmitter and camera to new heights. With a good wind, this kite will take his 3-pound package up to over 500 feet for some fantastic aerial views of the area. If you want a good workout, try reeling in 1000 feet of kite string! Jon plans to attach two radio control servos to remotely point his camera on his next flights.

Finding ATV Activity

If you're in an area with little or no ATV activity, try to get a nearby friend involved or you may end up watching a TV screen full of snow!

Photo C. Fly a kite with ATV!

Sometimes all it takes is a knowledge of 2 meter calling frequencies to scare up some unexpected contacts. 144.34 MHz has become the calling frequency in the Midwest, and 147.45 MHz in parts of Ohio. If in Southern California, call on 146.43—that will usually net you an ATVer.

Video Tape Contest

The Western Washington ATV Society is sponsoring a video tape contest. All you have to do is make a 15-minute video presentation using home video equipment. First prize is an ICOM IC-1275, second prize is an AEA FS-430 ATV transceiver, and third prize is a P.C. Electronics receive converter. For complete rules, send an SASE to WWATS Video Contest, 353 S. 116th St., Seattle WA 98168. All entries must be in by March 1, 1990. Winners will be announced at the Dayton Hamvention 1990.

ATV NET—3.871 MHz

In the eastern half of the country, a weekly ATV net meets every Tuesday night at 8 PM EST on 3.871 MHz. I'd like to see this become a national net. Would anyone would like to volunteer for western net control? If you'd like to find out about local activity in your area, check into the ATV Net or send me an SASE. I'd be happy to help hook you up with any local ATVers. I can also be reached via the N8ET BBS on packet.

In the following months, we will cover ATV repeaters and special happenings, plus circuits you can build to enhance your ATV station. Stay tuned . . . 73s, Bill

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Bill WB8ELK, our new ATV columnist, has been active in ATV since 1969. He's noted for his many high altitude balloon ATV experiments. He holds an MSEE and owns Elktronics of Findlay, Ohio, a business that specializes in ATV products. Bill is also co-publisher of Amateur Television Quarterly Magazine.

Number 33 on your Feedback card

LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Avenue
Saugus CA 91350

Nineteen-year-old Kelly Howard N6PNY, a star in the *New World of Amateur Radio* video, and one of my panelists at the Amateur Radio Media Forum at the Dayton Hamvention, noticed that there was nothing at the Hamvention for younger hams and young people wanting to be hams. I suggested she talk with the planners of the 1990 Hamvention. Here is her message . . .

To the Young

"You may be asking yourself, is it really true? Are we finally going to have something especially planned for the younger folks to get them interested in our world of radio? You can stop wondering because the rumors are true. On Saturday, April 28, young people will be gathering at the Hara Arena in Dayton, Ohio. They will share the day with a room full of enthusiastic ham operators and working amateur radio gear.

People and equipment are ready to share the Amateur Radio Experience with young people who are interested, or who might become interested. This gathering will permit those attending to contact someone in a faraway land, or maybe on the premises of the Hamvention itself. Along with being able to communicate, many door prizes will be given. The day will be very uplifting for all.

"Another question you might be asking yourselves is, how did this forum all come about? It all started when I first went to Dayton Hamvention in 1989. The convention was so overwhelming, there was hardly any time to sleep, let alone see all the exhibits in three days. On Sunday, the last day of the event, everyone involved in the planning of the Hamvention gathered in a Mexican restaurant and talked about the wonderful time they had. I was invited to join this group in their memories and thought this the opportune time to throw a little of the future at them. I brought up the idea of a forum for younger people where they could feel free to ask questions, and under the supervision of young hams, to contact other ham operators anywhere those little frequencies allowed them to. Kind of like a Children's Zoo where they could actually touch the animals to get more familiar with what is really out there in this huge world of ours.

"That's what this whole thing boils down to as far as getting it started. But let me tell you just getting it organized was the fun part. Not until you actually set your mind to doing something does it seem so easy. There have been so many people right beside me all the way with this who are willing to help no matter what. People really took off on this idea and got fired up about it.

"The weekend of the 1990 Dayton Hamvention will hold many exciting adventures, and I promise that this forum will be one of them. If you are a teenager or the parent of a young person interested in amateur radio or who might become interested in amateur radio, bring them by. We will introduce them to our special world. Our own new world of amateur radio. So come one, come all, and have a good time. . ." de N6PNY 73

Number 35 on your Feedback card

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS, (120 baud, 8 data bits, no parity, 1 stop bit, (603) 525-4438) Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters l or ι, or even the number 7. Thank you for your cooperation

Needed: Manual and schematics for a National NCX 5 transceiver. I will gladly pay postage and copying expenses. *Kevin Lemon, 11 Bartlett St., St. Catharines, Ont. Canada L2M 5K8.*

I am looking for an instruction manual and/or schematic for a "Thunderbolt 305" 10m amplifier. I will pay for copying and shipping. *Arnold "Ben" Irvine N3CNH, 653 Blue Church Rd., Coopersburg PA 18036.*

I need a schematic diagram and/or repair manual for a Galaxy III Transceiver by World Radio, 80-40-20. I will pay all costs for a copy, or I will copy and return the original. Thank you. *Jim Crawford NY5Y, P.O. Box 643, Lovington NM 88260.*

Wanted: ICOM FM unit EX-106 for an ICOM 6 meter transceiver Model IC-551D. *Piero A. Sassu N3FVG, 714 W. Marshall St., Norristown PA 19401.*

I need service information and a schematic for a DSI Instruments Inc., Model 5600A Frequency Counter. I will pay copying costs and postage, or I will copy and return the original. Thank you. *John Rusinko, 38A Union Ave., Little Falls NJ 07424.*

Never Say Die

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to force others to suffer as I did.

A few years ago I explained all this and came out with my set of four cassettes to help make the code more painless. The brainwashing caused by the FCC's acceptance of the progressive code system and its support by a number of firms with code courses has made it so only a few of the people who've bought my tapes actually use them as I recommend.

My first tape (73T05) has the letters, numbers and punctuation to help people memorize them. One or two times through should do for that. Then I have a practice tape for people who actually want to bother to learn to copy code at 5 wpm (73T06). Tape 73T13 will help you learn to copy at 13 per. I put this out because it was simpler than trying to convince everyone just to skip it and go to 73T20. If you want to make extra work for yourself, that's your decision. It takes about twice as long to master both 13 and 20 wpm speeds as it does either of them alone.

There are undoubtedly some other excellent code tapes. I should buy 'em all and see which are good and which aren't. I'll tell you what, you check 'em out for me and let me know and I'll use the time I save for something else—perhaps a day of skiing—or rag-chewing with DX ops I might visit some day.

Getting a ham ticket is pretty easy these days. A few hours on the code, the memorization of some Q&A and you're in. Oh, it isn't nearly as easy as it was a few years ago when Dick Bash sold the exact FCC exam answers, including the code tests. Thousands were able to get their Extra Class licenses without even having to know the code or one shred of theory.

I hope this will put the code into better perspective for you. It's easy to learn, but since there seems no way to break the perception kids get from us that it's hard, it'll keep us from getting much ham growth until we do away with it as an obstacle.

Even if we were to completely eliminate the code from the license exam, I feel that we'd still have to mount a major PR and advertising effort to attract youngsters to our hobby. It's just that without the code we might be able to get most of 'em licensed.

If you want to know more about how the brain works, there are plenty of good books on the subject. If you run into me on the air ask me about it—and settle back for half an hour. I doubt if many people will be interested in my own extensive (and to me, fascinating) research on how the mind works, so I'd rather you don't bring it up when I'm giving a talk at hamfests. I have a pretty good idea why not one scientist has yet been able to even get a hint as to how our memory works.

If you are Elmering newcomers, try my code system and see if it doesn't work miracles for you.

Faster, Faster!

While 95% of us are still communicating, and I am using the word in its most generous sense, at an effective rate of a few words per minute, a small coterie of hams are tripping along at a brisk 1200 baud. Baudy bunch.

Rag-chewers are able to mumble about 125 indistinct words per minute. The throughput plunges on 20m, when one is fighting QRM. Since ops seem to figure that when there's 2 kHz between two groups in contact that this constitutes a clear frequency, almost inpenetrable QRM is the norm.

If you read the October 73 you know that there's a growing group of hams experimenting with 56,000 baud (56K) packet. Many packeteers are running at a creepy 300 baud, with 1.2K (wow!) being the fast lane. It was mentioned in October that the Japanese are running 9.6K, using fax ICs.

For some reason there seems to be an aversion to translating bauds into words per minute, which might make throughput more understandable. 300 baud, when we're sending the 8-bit ASCII code, plus a start, stop and parity bit, means we're using 11 bits for each character. That's 300/11 = 27.27 characters per second = x60 = 1636 characters per minute. If we take the average word to have five characters, plus a space, we're talking about 275 words per minute. Not bad, compared to talking.

At 1.2K we're up to 1090 wpm. At 9.6K we're at about 8725 wpm. 56K brings us to 50,000 wpm. If we have 500 words per page, that's 100 pages per minute. Heck, even my editorials wouldn't take long to send at that speed. In more practical terms, if you start communicating at this speed by writing, it might take you ten minutes to write the page and then 1/100th of a minute to send it—about a half second. That's about right. With that speed it would be easy to have a couple hundred round tables all on the same channel without any interference.

Of course, if anyone starts taking my suggestion about setting up a 16-bit dictionary seriously, we could assign bit combinations to 65,000 different words and send each as one 16-bit word, thus increasing our throughput by 3.5 times to 175,000 wpm.

Why Not Packet?

Since a packet TNC and computer doesn't cost much these days, I suspect the main obstacle stopping most of you is the daunting new technology. It's as full of acronyms as computers and there are few reliable learning materials sources. If you want to get a headache even Excedrin can't touch, just try reading a packet handbook. Good luck.

We're all cautious (afraid) of new things, so it's easier to put off thinking packet than to face coping with a whole new language. With the average ham age almost 60, tender egos are right out there on line when it comes to looking foolish. And that's what it looks like we're all inevitably going to do when we finally take the plunge into packet. Isn't it time to demystify packet?

The RTTY Revolution

Along about 1948 I got interested in RTTY. Lordy, that was over 40 years ago! Getting basic information about RTTY was every bit as difficult then as packet is today. In between television jobs, I took some time to build and experiment with RTTY. Thus, in 1951, when I got a job as a TV director with WXEL in Cleveland, I was delighted to find they had a mimeo machine. I'd been fussing with my fellow RTTY experimenters, grumbling that someone should publish a newsletter. When a mimeo machine turned up, I quickly put out my first publication. Within a few months I had over 2,000 subscribers!

This got *CQ* after me to do an RTTY column. Both in my Amateur Radio Frontiers newsletter and in my *CQ* column I did everything I could to make RTTY simple to understand. I explained the fundamentals—described all the available equipment—how to build terminal units—how to fix printers.

When repeaters came along in 1969 I did the same with *73*, backing it up with a monthly Repeater Bulletin. These articles made repeaters understandable and soon had over a hundred thousand hams enjoying repeaters.

Now I'd like to see simple basic articles on packet. I'd like to see articles on higher speed experimenting, so let's get busy with 4.8K, 9.6K and on up to 56K. Heck, why not 112K? Sure, it takes more bandwidth, but the throughput far more than makes up for the extra bandwidth. As was mentioned in the October issue, when you go from 1.2K to 9.6K your signal takes up five times as much spectrum, 100 kHz vs. 20 kHz, but your throughput goes up by 46.7 times. Whew!

But *I'm not at all sure we're* up against a wall on bandwidth. When Ma Bell's minions tell me they're pushing 117K through twisted pair wires, I know darned well they have some pretty good ways of handling that digital data. Between narrowing our bandwidths and compacting our data, I'll be surprised if we can't get a 9.6K channel so it can be used on 20m.

Please don't make me turn to Japan for solutions to these problems. Let's see what you can do. I'll be delighted to help get your info out to spur on others via *73*.

In the meanwhile we need articles on packet basics—articles written in plain English, with as few acronyms as possible. This will encourage a few thousand more hams to give packet a try. This, in turn, will provide the interest needed for more experimenting.

We all want to know how packet works. We also want a simplified explanation of what equipment we need to try it. We need step-by-step guidance through our first contact, both on HF and VHF.

As we get into higher speeds we may well want to move some VHF packet repeaters up to the microwaves—the same ones the FCC will darned well take away from us if we don't start using them. 1.2 GHz, for example, is a great band—and virtually empty. There's plenty of equipment for this band available too.

Pictures, Too

Once you're set up to move computer data over the air you can send anything you like. You can send digitally encoded music, text, computer programs or even pictures. The Japanese are busy sending color graphics via packet using the NPLPS protocol. This is the system developed for use in the U.K. for their home computer information service. It's a data compressed way of sending graphic information.

Of course, if you prefer to spend your declining years rag-chewing on 75m instead of experimenting—or perhaps working desperately toward your Worked All Counties award, hoping to leave your hard-won certificate to your widow as your main legacy, then I shouldn't bother you with visions of the fun you might have pioneering a new technology.

Parity

It's just a small loose end, but earlier on I mentioned a parity bit. This is an extra bit which is added to your data in order to let you know when you are having transmission errors. You can agree on odd, even or no parity. Odd parity means your computer will add up the "1" bits for a character and, if the number is even, add an extra bit so the total is odd. Thus, if the person getting your message gets any characters which have even parity, you know you are having problems.

I also mentioned mumbling on voice. Oh, I don't mind so much if you mumble while you're talking to me during a QSO, but at least give me a break when you are calling! Please enunciate your *call letters clearly* and distinctly.

One other thing, why do you get upset when I get your call wrong? I carefully spell out the letters of my call and then you come back to W2MSB or something. I correct you and you don't pay any attention, still calling me W2MSB. Then, when I purposely mangle your call in retaliation, you get all bent out of shape.

Another Way To Reach Kids

I've been fussing with hamfest officials to push their local clubs to set up exhibits at hamfests and conventions which would explain some aspect of our hobby rather than just sitting behind a table with some membership literature. Then the local media could be encouraged to try and get youngsters to come to the hamfest and see what amateur radio is all about.

It's a challenge to design an exhibit which will show how repeaters work and communicate how much fun we have with them. Or why DXers are so dedicated to their seemingly idiotic pursuit of making ten-second contacts with 400 different countries.

I mentioned that when your club gets an opportunity to set up an exhibit in a local shopping center that it should be

designed to educate kids rather than the usual table with pieces of almost unreadable ARRL throwaways and a ham busy operating a rig several feet away, talking some strange language.

I've seen the ham exhibits at several world fairs and none of them have been set up to try and sell our hobby. They all have had ropes to keep the public away. The ham gear is usually brand new, state-of-the-art, expensive-looking and frighteningly complicated.

Okay, we've managed to screw up every opportunity to sell our hobby so far. You only have to look at the ARRL ham videos to see the problem. Like our fair exhibits, they are exercises in self-congratulation, preaching to the choir. None of them have been designed to try and interest newcomers. No one involved has done the most basic marketing-oriented thinking—putting himself in the place of the potential customer and saying, hey, what would get me to buy into this hobby?

Well, if you and your club are just too busy to try and sell amateur radio to kids at shopping centers or at hamfests, I have one more suggestion. Most cities have a science museum. Could your club take on designing and building an exhibit illustrating one aspect of amateur radio for the museum?

Amateur radio is a whole bunch of hobbies, so each needs to be sold differently. Imagine your science museum with exhibits from local ham clubs, each showing a different aspect of our hobby. We have repeaters, Oscar, DXing, special interest nets, home building, packet, SSTV, ATV, fox orienteering, certificate hunting, contesting, moonbouncing, etc.

If any club anywhere in the whole world decides to set up an exhibit to promote ham radio, please take a good picture of it for possible use in *73*. If that's just too much bother, at least write and let me know where it is so I can fly out and take the picture myself.

Yes, it's a challenge to try to communicate the fun we have with amateur radio—all in a small exhibit which can fit on a table at a hamfest, mall or science museum. Can you do it with some posters and pictures? Do you need a short video? It's better if the exhibit has some participatory aspect so kids can actually operate it in some way. Get 'em personally involved.

Let me know how you make out.

The Desktop Publishing Revolution—And You

Unless you've been particularly isolated from world events, you're aware that desktop publishing is a roaring new industry. On the off chance that you need a hit in the head to get your attention on what this new industry means to you . . . whack!

A recent reader survey shows that 80% of you already have a computer. Good first step. Probably. In reality desktop publishing was developed on the Macintosh and bloomed in Apple country. The PC crowd suddenly noticed that something important was getting away from them, so they've been playing Big Mac catch-up—with only fair success. El Macco is still out in front.

So what does desktop publishing mean to you? Unless you're firmly retired and are devoting your remaining days to improving the world via the best golf scores you can enter on God's Score Card as your contribution, you probably have a good publishing application which you've been missing.

For instance, small retailers have been cleaning up by putting out newsletters and catalogs. Many products and services today require much more than a couple minutes of salesman time to make the sale. Just look at the complexity of today's ham products. Few of them can be explained in a simple magazine ad—many aren't given a reasonable chance in the stores. The products, their benefits and nuances are just too complex to communicate in anything less than a booklet.

Retailers are getting their customers to keep coming back with newsletters and catalogs. Few stores can survive on first customer visits. It's the repeat customers who make or break a business. A recent survey of retailers who have started newsletters for their customers shows they've found them to increase their business by at least 50%. Some have been registering 50% per month increases, according to a report on desktop publishing at the Consumer Electronics Show.

I've mentioned in the past the power of a newsletter not just to keep a ham club alive, but to contribute substantially to its growth.

Starting Up

If you're going to start from scratch and buy a Macintosh with a laser printer you're going to have to shell out around $7,500, including software. That's a pittance for most businesses.

You know, even though I've set up a $500,000 state-of-the-art typesetting system for Wayne Green Enterprises, we've added a Macintosh desktop publishing system. It doesn't do everything the big system does, naturally, but it sure takes the load off for smaller jobs.

For instance, I've been writing a *Green Congressional Technology Newsletter*. I write it on my Model 100 laptop computer, which I use anywhere I happen to be. I dump my copy to a disk which is then transferred to the Mac. It's then printed out on a laser printer and the finished pages are sent out to be printed.

In this way I'm able to send a newsletter to Congress quickly and inexpensively, helping them cope with the impact of technology on their legislative decisions. They need a good information source on amateur radio, CB, compact discs, DAT, synthesized sampling, digital communications, cellular radio and so on.

The Mac also has speeded up and cut production costs on *Music Retailing*, a publication we send to some 10,000 record retailers. I write my usual long editorial, the editor adds information sent in by retailers, plus information from record companies and the

industry. The aim is to help boost CD sales and to provide an advertising medium for record companies to reach music retailers.

My wife Sherry has been learning how to use the Macintosh. She bought a complete desktop publishing system and uses it to put out a newsletter/catalog for her sixty how-to-dance videos.

The how-to video market is largely a mail order business since so few video stores have enough demand in their small sales area to stock anything more than best-selling movies. The few video mail order catalog firms are listing her videos. The biggest, S.I. Video, says hers are their best-selling videos!

So, as you can see, I'm surrounded by desktop publishing these days—at work we're cranking out newsletters without bogging down our main typesetting system (which is kept quite busy with *73*, *CD Review* and *The CD Guide*.

Sure, there are some businesses where a newsletter or catalog wouldn't be helpful, but not many. Just in the last two years the technology has progressed to where it's practical to put together newsletters in the office or at home. Any real entrepreneur should be able to make a desktop publishing system pay for itself many times over doing newsletters and catalogs for local businesses as a part-time home business.

What real estate business couldn't use a monthly listing catalog? Retailers need catalogs as a way to move close-outs and keep from building up dead inventory. They also want to remind customers to come in and see what's new—no store traffic, no business. And what a great way to make sure prospective customers understand the benefits and features of new products?

How about getting some local restaurants to use daily printed menus which customers can take home as souvenirs to remind them to come back?

Look at the incredible success of catalogs such as JS&A, DAK and so on, catalogs where a full page or two are devoted to explaining the details of a product. That beats the heck out of a simple product listing.

I'm always astounded at how much of a sales pitch many ham manufacturers have for their products when I get an opportunity to talk with them in person—like at Dayton. Many have a whole raft of reasons why I should buy the product—reasons which I'd never guess from their magazine ads and brochures. If they could produce some extensive sales information to send to reader's service requests I'm sure they could double or triple sales.

Ham Clubs

Ham clubs can easily double meeting attendance with a newsletter. To get members to meetings you have to have a program which sounds like fun—some food—and then make sure they plan for the meeting way ahead of time. If the meeting is fun you'll have a good chance of getting 'em back the next time.

Now, how do you make meetings fun? Well, that calls for a book-length editorial. It means not only providing good entertainment, but recognition for each person—plus plenty of opportunities to mix and talk with other local hams.

It means getting DXers to bring in and show their prize QSL cards. It means getting packeteers to bring in their printouts of interesting contacts. It means getting the builders to bring in their latest gadget for a show and tell. It means club activities such as fox hunts, Field Day, VHF contests. It means getting all this news and excitement into newsletters.

Sometimes I think you'll get fed up with me exhorting you to go into business for yourself. Then I get a letter from a reader saying my editorials got to him and he's done it successfully—and thanks. A recent letter from a handicapped ham said my editorials got him over being sorry for himself and got him going. He set up a computer and is doing well as an independent programmer—working at home. I'm not going to shut up until every one of you is making more money than you really need. It's out there if you have the guts to go for it. You don't even have to be able to walk, talk, or even see.

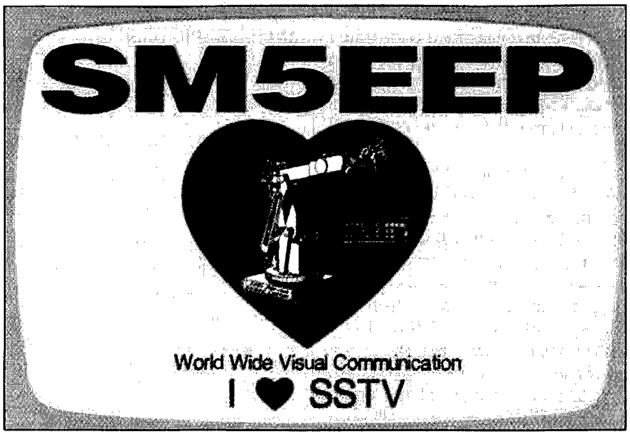
Look, when microcomputers first came along I wrote in *73* and said hey, here's a new industry starting, why not take advantage of it? Like ham radio, it was a technical business, perfectly geared to hams. Hundreds of hams did go into computers—with hardware, software, retailing—and many who got there early got rich.

Then came the compact disc. I wrote again explaining the opportunities open in this brand new industry. Though the microcomputer industry grew 235% a year for eight years, the compact disc industry has been growing even faster.

Desktop publishing has been growing like stink, but you haven't seen anything yet. Since most of you have computers it isn't like you have to start from square one to learn. Of course if you'd prefer to wait for me to spot another new high tech industry starting up, all okay. Why get rich today when you can do it tomorrow and spend today watching TV, drinking beer and taking it easy. Right? Then you'll start whining because I'm charging $20 a year for *73*.

Speaking of $20 for *73*—you know, that's about the price of a good dinner out these days. And that's about what *73* cost for a subscription back 29 years ago when I started it! In 1962, when I moved to New Hampshire, a dinner at the "88" restaurant in Manchester ran about $3—and that was by far the finest restaurant in the state. Most things have gone up at least ten times in the last 28 years, so stop griping.

How many needs can you think of for newsletters? One purely personal application for me is for a quarterly *Drum Newsletter*. The USS Drum (SS-228) is on permanent display in Mobile, so



QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock, NH 03449. Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

that's where my old WWII submariner crewmates gather for a yearly reunion. The *Drum Newsletter*, which I've been publishing for quite a few years, helps keep the group together and bring 'em back for reunions.

Sherry's been editing and publishing a *Mensa SIG* (Special Interest Group) *Newsletter*, which her Mac makes easy. Are you a member of a club or group which doesn't have a newsletter? Perhaps there's an opportunity to have fun and be of some value to others. If I weren't a bit too busy, I'd start a retired racing greyhounds newsletter to help find homes for the thousands of dogs which are no longer of value for racing, but which make incredibly wonderful pets. I hate to think of these beautiful, loving and intelligent dogs being killed once their racing days are over.

If the cost of a desktop publishing system is a bit steep for you, you might check around and see if there are some systems available for rental on an hourly basis. We have one in Peterborough, so it isn't like this is exactly a rarity. This is probably an el cheapo way to get training on the system—saving you some sleepless (but exciting) nights.

Look at it this way... I know you've been reading about the ICOM 781 and licking your chops. But, not having followed Uncle Wayne's advice, you don't have a lousy extra $7,000 burning a hole in your pocket. So get off the stick—shape up—get a move on—stop whining and making excuses. Hey, they even have spelling checkers for your computer these days, so not knowing how to spell is no longer an excuse.

Not that spelling (or grammar) has ever stopped anyone with gumption. Two of my long-time *73* columnists were so terrible at spelling and grammar that we routinely used their raw copy as tests of editorial skill. If someone could make their stuff readable we'd hire 'em. An interesting note—both chaps now publish successful ham newsletters.

I'd like to see specialty newsletters for every ham interest: fox hunting, RTTY, SSTV, packet, moonbounce, satellite, weather, traffic and so on. You start 'em up and I'll help you build a national readership. No, they don't have to be non-profit—charge for 'em and make it worth your while. Keep your eye on that 781, right? That way you can do well by doing good—like the missionaries did in Hawaii. 73

73 International

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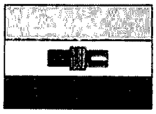

SOUTH AFRICA

Peter Strauss ZS6ET
PO Box 35461
Northcliff 2115
South Africa

Amateur Radio Statistics

The total number of Amateur Radio Licenses issued by the South African license authority has declined from 5163 in 1988 to 4691 in 1989. This is a decrease of 9.1%. The holders of ZR and ZS licenses have declined by 1.0% but the number of listener members has increased by 111%, from 342 to 722 members.

The 111% increase of listeners is a testimonial to the efforts made at various levels to encourage young people to join the amateur service and guarantee growth for the 1990s.

The Amateur Radio licensees are now being sorted into their respective ZS and ZR groups for the purpose of IARU statistics. 3328 Amateurs hold the CEPT class I compatible ZS license. 1363 Amateurs hold the CEPT class II compatible ZR license.

The number of repeater licenses has increased from 87 to 94, a reasonable 8%. Digital repeaters (digipeaters) increased from 14 to 21, an outstanding 50% and an indication of the interest that the Packet mode commands.

South African Radio Amateurs to Build Satellites

At the 10th Anniversary SA Amsat Satellite Communications Conference held in Johannesburg on 12 August, 1989, the President of the Association, Hans van de Groenendaal, announced that South African Radio Amateurs will build two satellites over the next three to five years.

The first project, is the development, design and construction of a communications module for the international Amsat Phase 3D satellite, which will be launched in 1992 in an elliptical orbit. This satellite is being designed to bring Amateur Radio satellite activity within the grasp of enthusiasts who own the minimum of equipment. It will include several educational experiments.

The second project, running in parallel with the international participation, is the development, design and construction of a microsat, a 30cm satellite, which will be launched in a low earth orbit 700–800 km high. This satellite will be self-contained and totally of South African origin.

The purpose of the SA Amsat microsat will be to provide digital store and forward communications, linking many Amateur Radio bulletin board systems around the country. "We are also planning to include a voice transponder and several educational experiments," Van de Groenendaal said. "The community will also benefit from this project, as the new satellite will enhance the Radio Amateur's ability to provide communications during floods and other natural disasters when official channels may fail."

The SA Amsat space programme will provide exciting opportunities for South African Radio Amateurs and students at technikons and universities to experiment with new technologies and develop their skills in Electronics and Computer Science. 73

MFJ 941D

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Performance

Electrically, the tuning circuit is a "T-match" system, using two variable capacitors in series with a tapped inductor shunted to ground. One would expect this circuit to exhibit a moderately high Q, similar to a "T section" filter. And it does, as the optimum settings for a given match are quite narrow—that is, one setting of the inductor is usually best. Where the mismatch is more severe, the settings on the 941D become critical. Conversely, when presented with impedances in the 75 to 100Ω range, the tuning is quite broad.

So far, I've been able to match up random 500–600Ω longwire antennas, using a good ground connection as a counterpoise. The settings are very sharp, but stable and repeatable... very important when contesting and jumping around between bands. And there's been no evidence of the balun core saturating at this power level. The 941D's power and SWR meter agree quite closely with a Bird 43 Thruline on all bands from 160 through 10 meters. A toroidal coupler is used, as sensitivity of wattmeters is quite low in the HF range. SWR is calculated by setting the front panel control for a full meter deflection, then switching to REF.

Using the 941D, I'm able to set up the A3 on 40 meters to operate under 2:1 from 7.200 to 7.300, or from the low end of the band up through 7.125, just by changing the inductor setting. Fifteen meters is similarly covered with one setting, resulting in under 2:1 performance across most of the band. In either case, you can get the A3's original settings by switching either coax line to DIRECT on the front panel, so rapid QSYing is a breeze.

For 160 and 80 meter operation, I'll use an end-fed 250′ longwire, connecting a balun at the feedpoint to eliminate RF burns in the shack. By attaching the counterpoise outside and transforming down to open wire line, the internal 4:1 balun will be matching 150–200Ω to 50Ω unbalanced, and it should tune fairly smoothly. Pretty versatile! 73

Pete Putman KT2B, former "Above and Beyond" columnist, has written many reviews for 73. You can reach him at 3353 Fieldstone Dr., Doylestown PA 18901.

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of this magnitude or greater, and on October 17 this attention to detail paid off. Condor withstood the test and went on to handle a traffic load that would boggle the mind of anyone listening in.

There is no way to establish the message count handled by those using Condor, but it has to be in the thousands. Unfortunately, the Condor Connection is slated for oblivion. The FCC recently reallocated the spectrum between 220–222 MHz to Land Mobile Services.

What About the Next Time?

In the crowded amateur bands of California, there is no place left to relocate the Condor Connection. As vital as it is, there appears to be no way to convince repeater owners of 2 meters, 220 MHz and 450 MHz to vacate channels for Condor.

As I am writing this only hours since the emergency began, information pertaining to amateur radio involvement is still scarce. Some of it, regarding organized malicious interference, is dismaying. I enjoy writing about the triumphs of those in our hobby/service who, like Al Romeo N6OJO, Frank Collins N6TAF, Lew Jenkin N6VV, Mark Gilmore WB6RHQ, and countless others whose names we may never know, are providing the kind of community support indicative of what we hams are supposed to be.

The San Francisco quake brought many hams closer then ever before. It proved the importance of the new digital modes and their ability to handle volumes of traffic quickly and effectively. It has also opened up a new dialogue between the analog and digital worlds that will definitely lead to more interaction and cooperation between the two.

CBers Not to Blame

But the quake also pointed out that we have among our ranks psychotics holding amateur radio operator licenses. We cannot excuse the organized jamming of the emergency communications. We can't blame it on "CBers with stolen rigs." Hams did it. People who studied for their licenses. Who took a test of Morse Code and amateur radio theory. Human beings who probably shelled out several thousand dollars to set up a ham station, and what for? To destroy!

In the late 1970s and early 1980s, California had a master legal tactician who devoted himself to putting the sickies off the air. He was able to reduce the amount of malicious interference to almost zero. The Dayton Amateur Radio Association recognized his work and awarded him its Specific Achievement Award. His solving the jamming problem also almost cost him his life when he suffered a massive heart attack as a result. Joe Merdler N6AHU, where are you when we need you! 73

You can reach Bill Pasternak WA6ITF at 28197 Robin Ave., Saugus CA 91350 or on MCI, Westradio 324-1437.

Dx

Number 36 on your Feedback card

Hams Around the World

Bob Winn W5KNE
℅QRZ DX
PO Box 832205
Richardson TX 75083

DX Countries

There is no doubt that the DX Century Club Award (DXCC) sponsored by the ARRL is the most popular DX award in existence today. Most DX country awards are based on the ARRL DXCC Countries List. As I write this article, the number of DXCC countries is 321, but only a few days ago the ARRL's DX Advisory Committee (DXAC) recommended that two new countries be added to the list: Banaba Island and Conway Reef.

In late 1989, the DXAC considered many applications for separate country status, but they recommended only Banaba Island and Conway Reef. Applications they didn't recommend: Frederick Reef, Austral Islands, and the Marquesas, Tatoosh, and Guemes Islands.

The DXCC Countries List Criteria, like the law, is open to interpretation, and our interpretation doesn't always agree with that of the DXAC. But the name of the DXing game is countries, and no one says DXers can't search for new ones. The decision to make Rotuma, Banaba Island and Conway Reef new DXCC countries were the result of research by DXers. . . like yourself.

Countries Galore Revisited

Almost three decades ago, Bill Orr W6SAI identified several choice DX spots that might qualify for new country status for DXCC. His "Countries Galore in 1961" article in the January 1960 issue of *CQ* magazine is a classic. In several cases his crystal ball gazing proved true. Two of his suggested countries have become DXCC countries: the Sovereign Military Order of Malta and Hagian Oros (better known as Mt. Athos).

Enclaves

Though many of Bill's "countries" don't qualify under the current DXCC Countries List Criteria, the potential is still there. Perhaps by following his lead we can discover a few new ones. Future changes to the DXCC Countries List Criteria, such as the recent adjustments that added Rotuma, Banaba Island and Conway Reef, may pave the way. Possibly the most fertile ground is in the area of enclaves.

An enclave is an island of land belonging to one country which is located inside another country. West Berlin and Walvis Bay are notable examples.

Study the DXCC Countries List Criteria. Point 3(a), which defines the 75-mile rule, very nicely prevents several enclaves from becoming DXCC countries. And Point 4, which defines ineligible areas, nails the lid shut on embassies, monuments, etc.

But times change and the Criteria may change; the 75-mile rule may become the 20-mile rule, or the 5-mile rule, or eliminated completely. Who knows? Let's look at several European enclaves that cannot quality for DXCC status under the current Criteria because of the 75-mile rule.

The enclave of Campione D'Italia is a part of Italy that is totally enclosed within the boundaries of Switzerland. This enclave is located just a few miles from the Italian border near Lugano, Switzerland—described as a glamorous casino which has been Italian since the 8th century.

The West German enclave of Businger, near Schaffhausen, is also located within the borders of Switzerland.

Another unique part of Europe is the enclave of Baarle-Hertog, which belongs to Belgium, but is located within the borders of Holland, just 9 miles from Turnhout, Belgium. With Baarle-Nassau it forms the town of Baarle, Holland.

The intriguing thing about Baarle-Hertog is. . .it is not just a single enclave in the normal sense, but rather more than thirty tiny enclaves, some enclosing areas of land that belong to Holland—enclaves within enclaves. No clear line divides the two communities; they are intermixed. In 1984 a group of Dutch operators operated ON8SB/A from Baarle-Hertog.

The enclave of Llivia is a part of Spain completely landlocked inside France, just a short distance from Andorra.

DXing is fun, but creating a NEW DXCC country can be fun, too!

Continued from page 38

quickly, the transistor turns on and pulls in the relay. This switches the antenna over to the transmitter.

A second set of relay contacts mutes the receiver. When the key is opened, the capacitor starts to discharge. The amount of time required to do this is dependent on the setting of R2. The more resistance, the slower the delay. Resistor R3 limits the current to the transistor switch.

Testing and Troubleshooting

Very little can go wrong. Check over your work and apply 12 volts to the relay control line. The relay should pull in. Remove the 12 volts from the control line and the relay should stay in for a second or two, depending on the setting of limits. Of course, you must have 12 volts applied to the relay coil all the time. The only trouble you might get into is a leaky junk box transistor. I pulled my hair out for an hour or two wondering why my version for the 30 meter transmitter did not release the relay. Leaky junk box 2N2222 was the culprit.

Now when you key the transmitter, you switch antennas and mute the receiver. Of course, with the receiver muted, you can't hear the signal. I added a small sidetone oscillator to the transmitter. The circuit is a bit different from what most QRP operators have seen in the past. I wanted to have a good sounding sidetone, without spending a lot of time and money. What you see here is a tried and true circuit. I added it to enhance the performance of the 30 meter transmitter.

Sidetone Generator and Fine Points

Figure 4 shows the details of the sidetone generator. Note the LM386. This is a very common low power audio amplifier chip. The sidetone is generated and fed into the chip. This may seem like overkill, but we have a very good start for the audio part of a direct conversion receiver. All we really have to do is add the mixer and a filter or two. You can press a second 2N2222 into service as a low level preamplifier. (We could get better results with a low noise transistor, but we'll hold that one for a different month.)

Due to the high gain of the LM386, keep all leads as short as practical. The 470 mF capacitor on the supply line must be as close to the amplifier as possible. Do not leave this capacitor out of the circuit.

You can increase or decrease the gain of the LM386 by changing the value of R1. To increase the gain, decrease the value of R1. But beware! Instability will raise its ugly head if you raise the gain too much.

The sidetone is generated by—guess what?—a 555 timer chip. I've used these before and have always had good luck with them. They always work. I've added some extra capacitors to make up a simple filter to roll off some of the square waves from the output of the chip. This makes for a much nicer sounding tone. As always, you can pick the capacitor values to suit your own needs and tastes. Adjust the sidetone level via the 1kΩ trimmer.

Refinements

I originally wanted to keep the sidetone oscillator running all the time and key the output to the amplifier. This worked, somewhat. Given the amount of gain in the audio chain, the signals blanked because the sidetone bled through to the audio. I decided to key the Vcc to the 555, using another PNP switching transistor. As a second thought, I added a small red LED, mounted to the panel, to the switched side of the transistor. This LED flashes code as you key the transmitter.

You can change the frequency of the sidetone by changing the 100kΩ resistor and/or the 0.01 capacitor connected to pins 2 and 6.

Again, check your wiring for errors. Build the amplifier first. Apply voltage and touch the input of the chip, pin 3, with your finger. You should hear a loud buzz from the speaker. Set the level control to about halfway. After you complete the sidetone generator, ground the key line of the tone generator; you should hear the sidetone coming from the speaker. That's about all there is to it. Connect both key lines together, sidetone and transmitter. Ground the key line, the relay will close, and the sidetone will emit from the speaker. Just like the big rigs!

Stay Tuned

A lot is going on this new year. Look for some QRP mods for ICOM radios coming next month.

When the earthquake hit San Francisco late last year, many hams were on the air even though the grid power was knocked out. Next time someone pokes fun at your QRP rig, tell'em that low power is always better than no power.

Number 37 on your Feedback card

. . . de K6MH

If you've read *Surely You're Joking, Mr. Feynman*, or seen the program Nova did on the late Richard Feynman, you know already how Feynman cut through the cloud of multi-syllabic scientific jargon which, as a Nobel prize-winning physicist himself, he understood only too well, to illustrate, by dipping a sample of the O-ring material in his glass of ice-water, that it just wouldn't perform at near freezing temperatures. They hated him for that.

Another top physicist, David Bohm, has some interesting things to say, in layman's terms, that come out of The New Physics. Bohm, a student of Oppenheimer and Einstein, wrote one of the best books on Einstein's Special Theory of Relativity. Science texts mention the Bohm Diffusion, the Bohm-Ahranov effect. Bohm's book *Wholeness and the Implicate Order* is an astonishing, mind-stretching view of Universe. When he demonstrated mathematically that the flux we think of as empty space contains, in one cubic centimeter, more potential energy than the energy-as-matter in our entire physical universe, I knew instantly that something that outrageous had to be true.

What the New Physics is showing is that organisms are not "built up" out of parts, but are aspects of an unbroken wholeness. One poet of the new physics put it this way: Consciousness is not an island, it is the Ocean.

When people or groups think of themselves as separate from the whole, they behave in fragmented ways. Bohm is experimenting with a process he calls Dialogue. This sounds like a pretty familiar word, what can be new about this? People get together and talk, is that all? Well, maybe it's in the way they do it. If there is no leader, no boss, no ideology, no agenda, what would happen? Would it degenerate into small talk? Come on, you are hams, you've been through this in roundtables. So isn't small talk an agenda? What if we set aside our program of small talk? What then? Profound talk? Is that an agenda? If so, set it aside and keep talking. Sports, politics? More agendas. Without agendas does dialogue degenerate into aimless rambling? Can something emerge that is independent of what is being talked about, something that is read between the lines, a common ground, a rapport, an understanding between people?

Groups in U.S. and Europe that are experimenting with Bohm's model of dialogue are finding that indeed, when attention is present, and there is no monopolizing of this attention through indulging in opinions, or propaganda, that something like a group mind, or collective consciousness emerges. I'm not quite comfortable with either of these terms, since they seem to imply a whole that is made by putting parts together. Instead, what seems to be emerging is a natural unity that was there all the time, a consciousness or intelligence that is inherent in the way things are.

What does this bode for ham radio? I heard again last night from a well-informed source that ham radio is dying. What a shame. We have an incredible medium of communication. We shine in emergencies. Isn't there a worldwide emergency caused by a lack of experiencing this fundamental wholeness, this oneness of all life? Can amateur radio address that emergency? How?

Think Tanks

Think tanks seem to work very well in groups of five. Think of a basketball team, with five players. Think of the hand, with five fingers. This is your basic think tank. A handful of people.

Real thinking is not just reciting something you have learned. It is learning while speaking, a revelatory process. I have seen Bucky Fuller do this in front of a large audience, coming upon a breakthrough realization while talking. He intentionally spoke without prepared notes, instead taking his cues from what was "in the air," from sensing what the audience was ready to think about.

Isn't this what's fun in friendly conversation, that it's not just old stuff, but something new is happening? You're using old words and drawing on old information, but something else is present, too. Call it live awareness or whatever you like. It's fresh. If it isn't there, talking is deadly dull.

What Bohm is saying is that dialogue is a living process that is integrative, revelatory, refreshing, inspiring, energizing; that it reveals a harmony that is fundamental and universal.

So hams are supposed to organize think tanks on the air to solve the problems of the world? In a word, yes. Because no one else is going to do it. Not the experts, not your elected representatives nor your chosen deities. Only participation works. Delegation won't work. It's like sex. Leaving it to someone else won't do. You've got to be there.

For more about Bohm, see Quantum Leap, *New Age Journal*, Sept. 1989. 73

Number 38 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
PO Box 1079
Payson AZ 85541

Good DXing on the Way

You can expect February to be a fairly good month for DX, as conditions recover from the mid-winter doldrums and race toward the vernal equinox when DX is superb. Because solar flux will be very high for most of the month, all HF bands from 160 through 10 meters will give surprising results.

160, 80, and 40 meters ought to be good from sunrise to dark. Although MUFs will often be above 30 MHz, some days will tend to be worse than others, due to magnetic field upsets from excessive solar activity. These days are most likely to occur between the 12th and the 19th, and then again between the 24th and the 28th.

However, compared to recent years, conditions will be excellent on most days.

During times of flares and proton events, take advantage of 6 and 2 meters for special VHF DX and even auroral propagation. On the 9th there will be a full moon and a total lunar eclipse in Alaska and the arctic, as well as in Africa and Australia. The rest of us can expect a partial eclipse.

As always, look to WWV at 18 minutes past every hour for solar-terrestrial conditions and propagation trends. Remember: A high solar flux and a low A index are good. 73

EASTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	—	—	—	—	20	20	15	15	—	—	15
ARGENTINA	15	15	15	20/40	20/40	—	—	—	—	—	10	10
AUSTRALIA	15	15	—	—	20	20/40	20	20	—	—	—	—
CANAL ZONE	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
ENGLAND	40	40	40/80	40/80	40/80	—	—	10	10	15	20	40
HAWAII	15	15	20	—	40	—	—	—	—	—	—	15
INDIA	15	20	—	—	20	—	—	—	—	—	—	—
JAPAN	15	—	—	—	—	20	20	15	15	—	—	15
MEXICO	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
PHILIPPINES	20*	—	—	—	—	—	15	—	—	15	15	—
PUERTO RICO	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
SOUTH AFRICA	—	40	—	20	20	—	—	15	15	15	—	—
U S S R	—	—	—	—	—	—	20	15	20	20	—	—
WEST COAST	15	20	40/80	40/80	40/80	40/80	80	20	10	10	10	10

CENTRAL UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	15	—	—	—	40	20	20	20	—	—	—
ARGENTINA	10	15	20/40	20/40	—	—	—	—	—	—	15	10
AUSTRALIA	15	15	15	20	20/40	20/40	20	20	—	—	15	—
CANAL ZONE	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
ENGLAND	—	—	—	—	—	—	20	15	10	15	20	—
HAWAII	15	15	15	20	20/40	20/40	—	—	20	—	—	15
INDIA	15	20*	20	20	—	—	—	—	—	—	—	—
JAPAN	15	15	—	—	—	40	20	20	20	—	—	—
MEXICO	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
PHILIPPINES	15	—	20	20	—	—	20	20	15	15	—	—
PUERTO RICO	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
SOUTH AFRICA	—	—	40	20	—	—	—	—	15	20	—	—
U S S R	—	—	—	—	—	—	—	—	—	20	20	—

WESTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	—	—	20	20	20	20/40	—	20	15	—	15
ARGENTINA	10	15	15	15	20	—	20	20	—	—	—	10
AUSTRALIA	10	10	15	15	20	20	20/40	20	20	—	—	—
CANAL ZONE	15	15	20/40	20/40	20/40	20	—	15	—	—	10	10
ENGLAND	—	—	—	—	—	—	—	—	20	15	20	—
HAWAII	10	15	15	20	20/40	[illegible]	20	20	—	—	15	10
INDIA	—	—	15	—	—	—	—	20	—	15	—	—
JAPAN	15	—	—	20	20	20	20/40	—	20	15	—	15
MEXICO	15	15	20/40	20/40	20/40	20	—	15	—	—	10	10
PHILIPPINES	—	—	—	—	20	20	20	20*	15	15	—	—
PUERTO RICO	15	15	20/40	20/40	20/40	20	—	15	—	—	10	10
SOUTH AFRICA	—	—	—	20	20	—	—	—	20	15	—	—
U S S R	—	—	—	—	—	—	—	20	20*	20	—	—
EAST COAST	15	20	40/80	40/80	40/80	40/80	80	20	10	10	10	10

FEBRUARY 1990

SUN	MON	TUE	WED	THU	FRI	SAT
				1 G	2 G	3 G
4 G	5 G	6 G-F	7 F	8 F-P	9 P-F	10 F-G
11 G	12 G	13 G-F	14 F-P	15 P	16 P	17 P
18 P	19 P-F	20 F-G	21 G	22 G	23 G-F	24 F
25 F-G	26 F-G	27 F-G	28 G			

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LETTERS

From the Hamshack

Any Philosophers on the Air?

I can't say how much I enjoyed your "Never Say Die" editorial in the December issue. I'm one of those members in an old fart radio club and you sure identified us in a hurry.

I'm signing your pledge into my log as of today. I've been a ham for about 15 years and my greatest disappointment is that I can't seem to get the average guy to talk about anything but his rigs and the weather. In fact, I don't get on much lately since it is so boring. Sure wish there was a philosopher's net. I'd start it myself, but I don't know anything about philosophy.

Ken Hoffer WB2UMQ
Holly NJ

Forbidden Topics

In addition to banishing from the airwaves all comments concerning weather and rig, I would include the following topics:

1. Information on what you've just eaten, you're about to eat, or will eat in the near future;

2. Details concerning medical problems, either past, present or future, involving yourself, spouse, relative, friend, or the family dog;

3. Any references to, or chronicling of, your incredibly trivial, mundane, and totally boring daily activities, which are of absolutely no interest to any other living human being;

4. And, while mobile, any evaluation of current driving conditions, identification of location and/or direction of travel, or description in any form whatsoever of your latest shopping adventure.

Craig Dible KB6LAK
Marina del Rey CA

Buy it Sight Unseen?

I am being encouraged to write you, as I'm told you'd be interested in my nonham observations. I am a Systems Operator with The Cleveland Free-Net, heading the Literary Special Interest Group. This computer open access communication system is free to its six thousand plus registered users.

How is one to learn what ham radio has to offer if they are unable to access it without a license? I've spoken to several people who are high ranking license holders. They tell me there are areas which offer cultural exchanges, yet without complex equipment, I am unable even to listen. It seems to me I am expected to buy something sight unseen.

Only in the last six months have I become acquainted with amateur radio. I've spent many hours listening to on-the-air conversations on the exorbitant equipment of a friend. I've heard nothing which commands my interest.

What inducement is there for me to pursue learning Morse code? By changing the outmoded license philosophy, let those who wish to use code, use it. Let those who would add a touch of new blood to the ham sector obtain access to the system without learning the code. You are turning your backs on the professionals who could easily pass a test and be brilliant operators.

Why are there so many different grades of licenses? I thought discrimination went out with busing. In computer communications, I can talk to the bricklayer and the PH.D. The most modest user is able to access the most exalted sections of the network. We are not licensed nor restricted by status. These systems are also under the FCC rule, yet we have very few problems with abuse.

While trying to attain information on amateur radio, I've run into nothing but high emotions sheltering a very antiquated hobby. I've attended a ham radio club meeting, and talked to the women in attendance. I found many of them were licensed, but that they had no interest in using their right due to the reasons presented above. I talked to a scholarly friend who has a receiver and has listened to ham discussions over the years, and he claims he finds nothing on the bands to command his interest to the point where he would pursue a license.

Linda L.A. Dush
Lundhurst OH 44124

73 Doesn't Waste Paper

Just a short note to say how I am pleased with *73 Magazine.* What I like are technical, how-to, build-it-yourself articles. I like *73* because it doesn't waste paper on contests. Not everyone is into contesting. I am into building and experimenting, especially in microwave. Your magazine gives me vast information and ideas! Just what a magazine (a good one, at least) should accomplish. Keep up the good work.

Also, I enjoy Mr. Green's editorials. I agree with most of them, especially the one damning CQ's attack on the ARRL.

Floyd Cureton KB7INM
Winslow AZ

Overwhelmed

I recently picked up a copy of your July *73*, the first amateur publication I've read since the early '50s. I was an active experimenter and near-ham back then. I've since retired from engineering, and I find my interest in old hobbies—radio and photography—growing. The July *73* overwhelms me. This is not the ham radio I remember!

A youngster with a growing interest would be distressed by his first look at 73. Equipment costing multi-thousands, TV, microwave, satellites, strange terms like "packet"—I think he would be as overwhelmed as I was. How about a column for the tyro ham-to-be? List the ham bands, the WWV schedule, the license classes. Include some build-your-own equipment, how-to operate articles, even some theory. Above all, include suppliers for basic components.

Anyhow, I'm sure I'll buy more issues of *73.* Maybe my perspective on hi-tech amateur radio will change.

Thomas L. Francis
Leonard TX

From the Pacific Northwest

I was shocked when I walked into the office of South Albany High School the other day—as part of a new program, they were looking for amateur radio operators and people with electronics experience to help in the school! I'm still working on getting both myself and our local ARC involved in the project. What a way to promote both education AND amateur radio!

Also, in the Pacific Northwest, the PNW (packet network) is changing its structure from a bi-layer (144 MHz for users, 220 MHz for backbone) system to a more efficient and reliable "staggered" system. Nodes are split into groups of three or four, with the group backbone on 220 or 440 MHz. The staggered groups are then linked with one total network backbone (connecting the group to the entire PNW network) instead of the original three or four.

Many BBS stations are upgrading to include conferencing systems so packeteers can talk without multi-connects. A ham in the Salem, OR area (SALEM node), has installed a BBS system that stores and retransmits messages by voice over a voice repeater to a retrieving station. The receiving station simply "dials in" a touch-tone sequence with his handheld, and his messages are "read" to him over the air. Perhaps someone will eventually expand it to allow voice messages to be forwarded to packet...

In Veronia, Oregon, a radio astronomy group is constructing a 24" telescope that will be remotely controlled by packet. A user will send times and coordinates for a photo to the sight via packet, and a local computer will control the telescope, take the requested photo with a digital CCD camera, and send the user a packet-encoded video picture in 16 levels of gray scale, as well as further magnification (at about the 14th magnitude) and enhancement. Various manufacturers have donated equipment, and UCLA students have helped write the software to run the system.

I've been trying to work out my summer schedule for 1990. I am still interested in the possibility of spending several months in New Hampshire working on *73 Magazine* with you if things work out. A summer with *73* would certainly expand my horizons even further.

Also, I have been thinking about how I can represent *73* on the West Coast. I believe that one of the keys to successful representation will be keeping *73* informed about the ham radio activities occuring in the area. I also feel that as a member of the future generation of amateur radio, I can help play a key roll in the promotion of our hobby to others my age, especially through the schools and involvement in community events. As a local official of the ARRL, I participate in a forum of ham radio ideas with other ARRL and ARES officials, sharing these ideas for the promotion and enhancement of amateur radio and public service operations. These ideas, while they are for the most part originated in the Northwest, are ideas that could apply to the entire country. I see this as the final key to successful representation of both amateur radio and *73 Magazine.*

Jason Conolly N7IME
Albany OR

Jason... Well, we certainly have plenty for you to do if you can make it!

How about drumming up an article on the packet-operated telescope? That'd make a great piece. Not only would it be interesting, but it would help our case with the FCC to have that in print. And it might even get some other groups to come up with other good packet applications... Wayne

The Basics, Again

I look forward to reading your magazine each month. Your editorials, for the most part, are right on. The October issue especially hit home. I own an electronics shop and deal with not only ham operators, but other "technicians" every day. When you say only 2% are qualified, you are absolutely right! Most hams I know are not even technically qualified to install a PL-259 connector on a piece of coaxial cable; some of them don't even know the differences between UHF, BNC, and N connectors. They are not stupid people, just uneducated.

It's time to get back to the BASICS of what the hobby is about so that these people know what is going on. Perhaps a series of short articles (which I would gladly write) about simple electronics theory pertaining to amateur radio are in order. I believe that most construction articles in the magazines today are ignored largely because the readers have no concept of how to begin! Nobody ever told them the difference between capacitors, resistors, inductors, and so on.

So how about doing the beginning hams and the old-timers alike a favor by leaving out one article on packet radio or fangle-bob ragtail antennas and replacing it with something basic to chew on?

Bob Minton NU7L
Boise ID 83705

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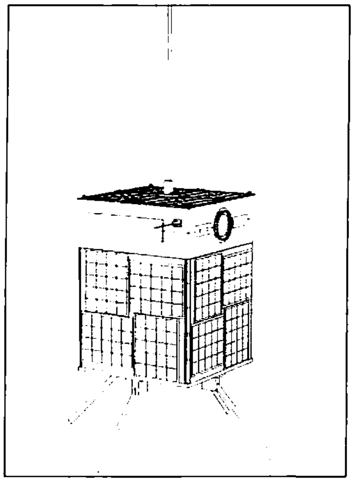

WEBERSAT and five other Hamsats are now in orbit and on the air!

Cover by Alice Scofield
Photo courtesy arianespace, inc.

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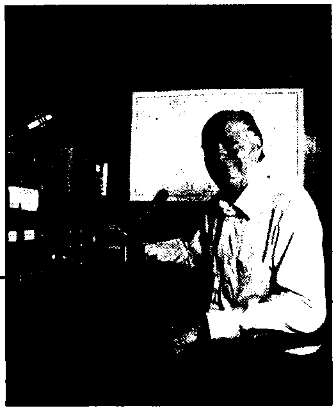
Contract: Not all viruses are bad. When your fingers touch this page, the unique DNA of your own strain of the amateur radio virus may easily combine with the latent AR virus in the pages of this magazine to produce a new strain which could do a lot of good if you pass this magazine around and infect a few others.

Number 2 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1



Desktop Publishing Revisited

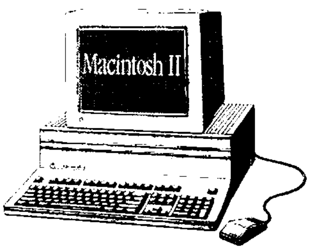
The Macintosh publishing system is so good (and getting better) that I expect it to eventually replace the $500,000 Bedford composing system we're using to do *73 Magazine*. When you consider that the Bedford has been the most advanced of professional composing systems for the last five years, that's saying a lot! And here it is being replaced by a relatively inexpensive home computer.

So what does this mean to you? That depends on how much drive you have. For about half the price of a good mininvan you can now buy a complete publishing system. I mentioned some ways to make money with it in my recent editorial. If you've ever considered setting up a small home part-time business, this is one to consider.

I'll tell you what. If you'll put me down for 5% of your profits, I'll tell you about a completely new publishing business I've thought of. It's brand new, as far as I know. And it's desperately needed. It's just that no one has thought of it before. To be fair, it probably wouldn't be a part-time business in most parts of the country. Revenues should run a minimum of $500,000 a year and the start-up cost of the business would probably be under $10,000. It could even be half that, if you have someone nearby with a good laser printer you can use. You should be able to clear at least a 20% profit, which isn't bad. Of course a hundred thousand a year doesn't go very far these days, so perhaps it isn't worth thinking about. If you're near a big city you could generate ten times as much revenue, which almost starts to get interesting. Think of it like a publishing franchise.

If you're interested enough in making money to start a small business and actually work hard for it. . .and you can get your hands on the $10,000 it takes to get it started. . . ask me for further details.

How come I'm not just giving this million-dollar idea away? Well, down through the years I've done just that several times. The result has been a lot of hearty pats on the back at hamfests and letters from readers thanking me profusely for putting them onto a new business which is making them rich. While I enjoy hearing these success stories, they don't warm my heart quite as much as some added revenue streams would. Oh, I won't waste the money. . .I'll spend it starting new businesses and giving employment to more people. . .as I always have.



Now, How To Build Your Ham Club

Once you've bought a Mac publishing system you can get some excellent practice using it to put out your ham club newsletter. This is a smart start, even if you plan to build a business with it. It takes time to learn how to use a computer. . .even a Macintosh.

Let's say you've volunteered to do your ham club newsletter. . .now what? What are you going to put into it? How can you use it to help build club membership and meeting attendance? How can you use it to generate more hams in your area? To attract more youngsters to our hobby?

I get hundreds of club newsletters every month. Some are very nice looking, some are awful. Disappointingly few are interesting to read. One of the secrets of successful publishing is to be interesting. It's the same secret as talking on the air. . .you have to be interesting.

Let's see, you've done a piece on the last meeting and one on the next. What else can you write? Put on your investigative reporter hat and grab your mike. Unless your club has alienated every active local ham, you probably have at least one member who's into DXing. Okay, what new DX has he worked lately? Print some of his best QSL cards. . .reduced in size, of course.

Six meters is going absolutely berserk these days. It's a band with excitement almost every day. Interview your six meter experts and get some of their passion into your newsletter.

You certainly have plenty of packeteers. Get an article from 'em on how easy it is to get on packet. . .exactly how to make their first contact. . .and why they're having so much fun with it. Talk with 10m Novice packeteers. Talk with packet DXers. Talk with 2m packet ops. Then write.

There must be at least one remaining club member who is building stuff. . .even if it's Heath or Ramsey kits. Get pictures and a story.

Set up your active club members to give you monthly activity reports on 6m, DXing in general, 75m DXing, 10m action, SSTV, RTTY, packet, OSCAR, traffic net activity, emergency nets, special interest net news, visiting DX hams, 2m repeater action, other VHF/UHF news, Field Day plans, contests, certificate hunting, etc.

You've got ail sorts of news sources right there in your area if you take the time to look. . .and ask. Once you get 'em started, your newsletter will be packed with interesting local news. This could lead to more interesting meetings, with show and tell sessions on home construction, SSTV, RTTY, packet and so on.

Don't forget to make a big deal out of the club Novice and General classes. An interesting newsletter will help bring youngsters to your meetings and classes. If you cover what your club members are doing, you'll start communicating the fun of amateur radio and you'll grab newcomer interest.

The newsletter, if spread around, will help build your club membership. . .and will get us more hams. See that some copies get on the bulletin boards in your local high schools. Get your nearest Radio Shack to give 'em away. You might even get your Radio Shack to advertise and at least cover the cost of these free copies.

Have a couple of club members check out the CB and HF channels for new blood. The newsletter could wean them from CBing into hamming. . . perhaps even before they learn to talk like Southern truck drivers.

Get copies to your local Boy Scouts. The Boy Scouts need 'em badly. I mentioned a few months ago that a lack of interest in hamming has caused the Scouts to drop the ham merit badge.

When your club president manages to corral an interesting speaker be sure to write it up in the newsletter. Most clubs which have invited me to talk have settled for a simple newsletter mention that I'll be talking. I can't think of one club newsletter editor who's written or called asking for a bio and what I would be talking about. I'll bet you do the same to your speakers, thus cutting your meeting attendance. This helps to discourage members from bothering to renew their membership.

If you don't have club members to tap for news of specific ham interests, then look for some non-members and get them to give you news. It might even get them interested in the club.

Have you any artists in the club? Cartoonists? Get 'em to help illustrate the newsletter. It's easy to scan artwork into the Mac.

Wouldn't you be interested to know what your local hams are working via OSCAR? Who they've worked of interest on packet?

I suggested a couple of months ago that it was almost time to

Continued on p. 76

QRX . . .

EDITED BY JIM BAIL KA1TGA

Hams Win Six OSCARs

Six new amateur satellites were launched on schedule Monday morning, January 21 (01:36 UTC) following a one-day delay because of bad weather at Kourou, French Guiana. AMSAT-NA President, Doug Loughmiller KO5I said that the successful launch is a landmark for the Amateur Space Program because in this one mission, more OSCARs were put into orbit than in the previous fifteen years combined. Dr. Junior de Castro PY2BJO saw his dream of easily accessible educational amateur radio come true when OSCAR 17—DOVE (Digital Orbiting Voice Encoder) deployed . . . Even primary school students will be able to transmit and receive with a simple HT (and tracking program) and experience firsthand worldwide communications through space technology.

New OSCARs up:

OSCAR 14 (UoSAT D)—Univ. Surrey, England—Packet, downlink 435.070 MHz.

OSCAR 15 (UoSAT E)—Univ. Surrey, England—CCD camera, experiments, downlink 435.120 MHz.

OSCAR 16 (Packsat)—AMSAT-NA—Packet, downlinks 437.025/437.050/2401.1 MHz (sideband beacon).

OSCAR 17 (DOVE)—BRAMSAT—Educational voice, packet, downlinks 145.825/2401.2 (sideband beacon).

OSCAR 18 (WEBERSAT)—Weber State College—CCD camera, packet, downlinks 437.075/437.100.

OSCAR 19 (LUSAT)—AMSAT Argentina—CW beacon (437.125), packet beacon downlinks 437.150.

AMSAT-NA is requesting hams to refrain from uplinking to any of the birds for the time being, while ground stations program them for future operations. In the meanwhile, grab a tracker and see how easy it is to experience the Space Age for yourself . . . TODAY.

SAREX 1990

Space Shuttle Columbia is scheduled for a ten day mission (STS-35), to be launched in the evening of April 26, 1990. Dr. Ron Parise WA4SIR, a Payload Specialist, has been cleared by NASA to operate voice and packet during this flight. By coincidence, the commencement of WA4SIR's operation coincides with the 1990 Dayton Hamvention and consideration is being given to linking these two major ham radio events.

This is followed by STS-37. Space Shuttle Atlantis is scheduled for a five day mission to be launched on June 4, 1990. Marine Corps Lt. Col. Ken Cameron KB5AWP, the pilot, has been authorized to operate voice, packet, slow-scan amateur television and fast-scan amateur television. Ironically, this flight coincides with another major amateur radio gathering . . . the 1990 ARRL National Convention in Kansas City, Missouri (June 8-9).

One of the prime objectives of both missions is school participation. The ARRL and NASA will provide teaching aids to interested schools. In addition, a Teleconference Radio Net to feed most amateur repeater stations in the United States is also planned. The repeaters will permit easy access to schools and the youngsters attending them. With the help of amateur radio clubs and members with hand-held equipment, students will be invited to share directly in the flights.

FCC Net Mess

A small group of hams who run HF nets and bulletin stations have been asked by the FCC to work up a plan to prevent future complaints in regard to phone patching, bulletins and on-air code practice. If no workable solution comes about, all of you may see a part of your operating priviledges withdrawn, and new restrictions placed on the amateur service.

The combined warning and request for help comes in a second letter from FCC Special Services Division Chief, Robert McNamara. It was mailed to the managers of nine nets and bulletin operations. Included in the list are the ARRL, the International Mission Radio Association and six others. The letter asks that the nine form a cooperative and work up a plan to avoid future conflicts between amateurs and future complaints to the Commission. At stake could be all CW practice nets, phone patching and all on-air bulletins operations.

McNamara says that his staff has evaluated over forty responses to his first letter on these issues. The text of the new letter leaves no doubt that the Commission will take punitive measures against the entire amateur community if more incidents like last year's fight over the use of 14.313 MHz take place. The FCC chief notes that the FCC really does not have the money to solve squabbles between hams. If they recur, everyone will suffer.

One suggested solution would require all phone patch activity to be conducted around the top 10 to 15 kHz on the 20 meter band and solely on the Net frequency.

New Way to "Pass" Your Radio Exam

Clinical trials are being performed on an ingestible capsule used to monitor the human body internally for temperature, heart rate, acidity, electrical conductivity, and pressure. The ¾" long capsule contains a telemetry system, NiCd battery, crystal temperature sensor, four electronic components with ceramic substrate, and a communications coil encased in an epoxy, silicon-coated shell. Information is sent via telemetry to a receiving coil in the user's T-shirt, which in turn is wired to a computer.

Johns Hopkins Applied Physics Laboratory in Laurel, Maryland, has developed the unit, funded by NASA, with input from physicians, military personnel, and other interested researchers. Russel Eberhart, program manager for the project, indicated that his team is working on an ambulatory receiver the size of a calculator that can record for a day, then download the data to a computer for analysis.

Oregon Amateur Petitions FCC for New Radio Service—and Wins!

The FCC's Christmas gift to Kenneth Seymour KA7OSM could turn out to benefit thousands or even millions of others. Last January the Beaverton, Oregon, ham—an RF and IC design engineer—petitioned the FCC for an emergency radio service for the outdoors. Originally *suggested for* placement at 70 MHz, the FCC has now proposed placing PELTS (Personal Emergency Locator Transmitter Service) at 220–222 MHz, returning to the general public some of the spectrum reallocated from amateur usage in Docket 87-14. The system will be confined to channels that are only 5 kHz wide, as are all other systems at 220–222.

The PELTS radio will be a short-distance, 3W portable with voice and homing capability, for use by backpackers, skiers, mountain climbers and others who need the security of radio communications while in wilderness areas. Base stations—to be licensed to rescue teams, ski lift operators and state and local governments—will be permitted up to 100 watts. No fee would be charged base station operators for a license. No repeaters will be allowed.

The FCC cited several cases of skiers and climbers who died in adverse weather conditions when rescuers could not locate them. "Such fatal accidents have increased the awareness among individuals, participating in outdoor activities in remote areas, of their inability to summon assistance if and when it is needed," the FCC said. The FCC emphasized that PELTS is intended only to provide the communications capability needed, and added that it is up to the governmental and private entities to provide the watch and response systems necessary to make the service work.

TNX to QRX Contributors

Thanks to: *A.R.N.S. Bulletin, W5YI Report, The DX Bulletin, Watts New, Westradio* and Doug Loughmiller KO5I.

Number 4 on your Feedback card

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston TX 77083

Hams In Space

It's been over six years since the first ham-in-space activity by Owen Garriott W5LFL from the Space Shuttle Columbia. Using a modified Motorola MX-300 two meter FM transceiver, Owen logged over 350 two-way contacts and was heard by at least 10,000 individuals in 23 countries. Total operating time was about four and one-half hours.

In the next twenty-three months, two more successful amateur radio activities went into orbit. The first was called SAREX, for Shuttle Amateur Radio Experiment. On the first flight of the Challenger, Tony England WØORE used a Motorola MX-340 transceiver with a window-mounted loop antenna like that used by W5LFL. The goals of this mission were to share the spaceflight experience with the largest community possible, to encourage youth's interest in science, technology and amateur radio, and to demonstrate the possibilities of earth-to-space SSTV (slow-scan TV). This operation was quite a success.

Tony's goal was to attract young people to his activities in space. Students at many schools were able to speak directly with an astronaut in orbit. Approximately 6,000 students participated in some way with the SAREX program.

When no one was available to operate the SSTV equipment, the transmitter and the ROBOT 1200C scan converter were set to automatically send pictures from the shuttle. Thus, many passes which otherwise would have been silent had two meter signals from the spacecraft. The system beacon identified with Tony's call, WØORE, in CW.

Within a few months of WØORE's mission, the Challenger carried the West German SPACELAB. On that flight three hams, two German and one Dutch, made many contacts using specially modified Bosch commercial transceivers with an externally mounted whip antenna. The uplink frequency was on 437 MHz and the downlink was on two meters, making this the first crossband ham-in-space operation. The recording system was left on during times when DD6CF, DG2KM or PE1LFO were not available. The unattended on-board equipment heard 766 ham calls and recorded them on tape.

Since the 1985 DPØSL operation, the Soviets have dominated orbital ham activity. From the MIR space station, Musa U2MIR and others have provided many excellent contacts for earth-bound amateurs. More activity is anticipated from MIR in 1990. The joint Hungarian-Soviet 10 watt, two meter rig with external quarter-wave whip provides an excellent signal which can be received with HTs, mobile rigs and home systems.

SAREX II

More American ham-in-space action is on the way. Ron Parise WA4SIR is slated for a trip to space around midyear on STS-35. This mission was originally scheduled for late April, but some delay is likely. If NASA budget constraints do not interfere, Ken Cameron KB5AWP will follow a few months later on STS-37. Each astronaut will carry a different version of the SAREX II configuration into orbit. Four variations are possible, ranging from two meter FM voice only to a combination of voice, packet, SSTV and FSTV (fast-scan TV). Ron will be taking packet radio but will also operate voice when possible. Ken's activity may include everything, but with uplink-only capabilities for the FSTV operation.

The primary STS-35 SAREX mission goal is to provide maximum opportunity for real-time communication between Ron and school classrooms. Due to the orbiter's launch configuration, direct earth-to-space contacts during school hours in the US will be impossible. STS-35 is scheduled for a night launch into a low orbit with an inclination which will allow only those in the southern part of the US easy access, and then only at night.

While ground station antenna elevations in Houston, Texas, may approach 70 to 80 degrees for a good pass, those in Cleveland, Ohio, may see less than ten degrees at the closest approach during the best encounter.

Photo A. Astronaut Ron Parise WA4SIR and Roy Neal K6DUE at a SAREX II planning meeting at the Johnson Space Center in Houston.

Hams in several countries must cooperate if Ron is to communicate with U.S. schools. Foreign stations capable of contacting the shuttle during North American daylight hours will provide radio and phone links to the schools. AMSAT will organize the packet and voice networks. Bill Tynan W3XO, AMSAT V.P. for Manned Space Programs, is the AMSAT point-of-contact for the effort.

Only simple equipment will be needed to make direct contact with the Columbia and the WA4SIR packet system. Standard FM 1200 baud packet operation will be used. Ron's TNC (terminal node controller) is a modified Heathkit HK-21 using SAREX software which allows for a "Field-Day-type" connect and acknowledgment, with little else. We hope that there will also be some time available for Ron to try general voice contacts.

The incorporation of unattended packet operation maintains all of the best features of previous missions. Messages can be sent automatically from the shuttle to listeners, and participants can call and connect with the onboard system. Their callsigns will be held in memory for later QSL requests in addition to the instant acknowledgment created by the packet connection.

The primary downlink frequency will be 145.55 MHz but, unlike MIR voice operations, the uplink is offset. Several frequencies are available, with 144.95 MHz the most likely. All participants should avoid transmitting on 145.55 MHz. Ron will NOT listen there. Actual uplink frequencies and orbital data will be announced via the AMSAT Nets and packet BBSs. (Uninformed hams operating simplex caused incredibly bad interference during W5LFL's and WØORE's missions.)

For STS-37 Ken KB5AWP is hoping for a camcorder instead of only a regular TV camera to go with the SSTV equipment. This would allow pictures to be taken from various places in the shuttle for later transmission to hams on earth. The packet radio portion of the system will be similar to that used for STS-35. Voice activity will be only during times when Ken is not on duty, asleep or otherwise occupied. The FSTV uplink activities will be limited.

This portion of the SAREX II program is only for preliminary experimentation. A small group of hams will be allowed to transmit wideband TV signals from Earth to space, pending FCC approval.

STS-37 is scheduled for a daytime launch which will provide significantly easier linkups with schools.

As with all shuttle missions, the Goddard Spaceflight Center will carry live audio on HF frequencies. The primary frequency is 14.295 MHz with 3.860, 7.185, 21.395 and 28.650 MHz also available for possible rebroadcasts of live and taped announce-

Continued on page 78

Give a Lift to Your ARC

BACAR—Balloon Carrying Amateur Radio

by Hans van de Groenendaal ZS6AKV

At one time or another, every club needs an injection of something new—not just to keep alive, but to grow.

Some years ago, a few disgruntled committee members of local amateur radio groups in Johannesburg met at a hotel to discuss that very issue—how do we stimulate our members? After many beers, someone suggested, "Let's build our own satellite!" He hadn't quite completed his sentence when general laughter poured cold water on the idea. However, one of the group said, "Hold it. . .it's not such an absurd idea—let's fly satellite equipment on a balloon." Project BACAR was born!

Objectives

Our goals, even after some seven years, are: to encourage experimentation with radio equipment, electronics, test equipment, and systems in a space-like environment; and to provide a wide range of amateur radio related activity for as many radio amateurs as possible. This includes design, development, construction, and testing; satellite tracking; mapping; direction finding; telemetry encoding and decoding; and FUN!

Getting Started

Our first activity was a direction-finding afternoon. Each participant was asked to report to the control center with the longitude and latitude of their home station, and then to give the bearings of three repeaters in the area. Using detailed maps, the control center plotted the information and reported back to the participant with the accuracy of his beam heading. Many had to climb their towers to realign their 2 meter beams.

Coke Special

Our first mission involved a simple 2 meter beacon of which the carrier was FM modulated with a tone. The frequency of the tone indicated the height above sea level. We achieved this using a simple thermistor measuring the outside temperature. Reasonably accurate "upper air temperature versus height graphs" are available from the local weather office. This was very much like OSCAR 1.

The circuitry, powered by a few dry cells, was simple. The entire package was encapsulated in a plastic coke bottle and filled with a low density foam.

Get Everyone Involved!

One of the objectives of BACAR is to stimulate interest, so we involve as many people as possible. We employ several teams: the launch team, which is responsible for the balloons, the gas, and the entire launch procedure; the control center team, which provides communication and VHF to UHF links for the recovery team; a broadcast team, which comments on the launch, creating a tremendous interest among the older amateurs who stay at home and listen; a mapping team, to collate all the bearing information received from home stations; and a recovery team, which is responsible for DFing the package after the balloon has burst and the equipment is parachuting back to the ground.

BACAR One

Mission One was greeted with great excitement (so were the other 24 to date). At 06h00 local time, all teams were in position. By 07h00, the balloon was filled with hydrogen (caution—use helium, if possible). The control center asked the local Air Traffic Control for permission to launch. The countdown began, and at precisely 07h11 BACAR One lifted gracefully into the blue skies over Johannesburg. The beacon worked perfectly. Soon, bearing reports were coming in from over a wide area, and the mapping team plotted the position of BACAR One.

Photo A. Dave Woodhall ZS6BNT with BACAR One—the "Coke Special."

At around 11h00, the control team reported that BACAR One was losing height—the balloon had burst and BACAR commenced its slow glide back to the ground.

The DFing teams went into action, and after many hours, they finally found BACAR on a farm some 100 km from Johannesburg.

Photo B. BACAR One Control Center with, left to right: ZS6AKV, ZS6AOG and mapping team, ZS6BFS and ZS6CAG.

Endless Opportunities

Spread over 25 missions, we have flown all types of equipment, including parrot (a voice store-and-forward repeater), a Mode A transponder, a Mode B transponder, and packet radio.

Mission 26, launched May 13, 1989, included a beacon on 1602 kHz to enable students to track BACAR on ordinary, MW radios. Unfortunately, it developed a problem after launch.

Mission 27, launched in the fall of 1989, includes a 6–2m transponder, telemetry monitors for gamma rays, rate of climb, UV radiation—and, of course, a medium wave beacon. With this, we will reach the ultimate goal of BACAR: to recruit young people into amateur radio in a fun way!

J.H.N. van de Groenendaal ZS6AKV, President, Southern Africa AMSAT, PO Box 13273, Northmead, South Africa.

OSCARs in the Classroom

Unique way to teach youngsters about space and amateur radio.

by Richard C. Ensign N8IWJ

When students at all grade levels are asked today what part of the curriculum offered by schools interests them most, astronomy and space science are high on their lists. As director of a public school planetarium for the past 20 years, I have seen thousands of students thrill to the sight of the night sky and to the spacecraft, such as Voyager and Viking, that have probed through the blackness of space to the planets of our Solar System. Students often ask me how these spacecraft get where they are going, and how the information they gather is sent back to waiting scientists on Earth. They also want to know how communication satellites work, and how some of those "birds" can just hang there in the sky.

As an educator who is also a ham, I can bring to students a ready resource pool of OSCAR satellites through which they can gain immediate hands-on experience in space science and technology. At any time in the school day there is at least one OSCAR above the horizon which we can call our own for a few minutes. Turning on our classroom station we can:

1. Track the satellite as it passes over us via computer or graphical aids and plot its real time path over the Earth on a world map or Earth orbit plotting map.
2. Assign teams of students to follow the bird with the station antenna rotor system.
3. Monitor the heartbeat of an OSCAR through its beacon telemetry (CW, RTTY, ASCII or voice).
4. Make contact via OSCAR 10 or 13 with another ham nearly halfway round the world and get acquainted with someone from another culture. We can also monitor others' callsigns on the satellite to see the overall pattern of communications coverage.
5. Gateway or go direct via OSCAR satellite to a distant U.S. school, allowing an interchange between students.
6. Monitor the progress of a polar expedition via an OSCAR digitalker (talking computer).
7. Listen to a Soviet cosmonaut talking to other hams as he passes overhead in the *Mir* space station and make our own attempt to contact him.

Advanced Activities

More advanced students can:

1. Investigate the spin period of an OSCAR satellite by monitoring and plotting its signal strength on a chart recorder or by analyzing its telemetry.
2. Measure the speed of radio waves as they travel tens of thousands of miles out and back from a Phase III OSCAR.
3. Explore the frequency shift of an OSCAR's beacon due to the Doppler Effect.
4. Measure the effect of atmospheric refraction on uplink and downlink signals from an OSCAR as it goes below the horizon.
5. Monitor data on micrometeorites from the new Webersat.

> ***"An easy way for a school to become involved is through an amateur with a satellite station gatewaying to a local repeater."***

As well as hands-on OSCAR activities, educators can use resources from organizations such as AMSAT and the ARRL to:

1. Give students an up-to-date feel for the nature of ham radio via the ARRL videotape "The New World of Amateur Radio."
2. Watch a videotape of the AMSAT launch from French Guinea and get a feel for the complexity of a multiple satellite launch.
3. Decode RTTY satellite bulletins and telemetry directly from AMSAT OSCAR 13.
4. Give students orbital information on satellites they can watch passing overhead in the night sky, like Russian and American manned missions and a giant Japanese mirror ball in orbit.

Getting Schools Involved

As Science Education Advisor for AMSAT-NA, I am currently compiling lists of schools with amateur radio satellite stations with the idea of establishing regular communications between schools via AMSAT OSCAR 10/13. An easy way for a school to become involved is through an amateur with a satellite station gatewaying to a local repeater. Then, all the school needs is a ham with an HT to become involved in satellite communications. Schools with established clubs can use some of the equipment already on hand to aid in building their satellite station. The education departments in many states often have grants available to aid in purchasing innovative classroom aids like OSCAR satellite stations. I'm happy to help any school getting started in this area and want to hear from any schools that are already "on the bird."

The DOVE

With AMSAT's MicroSats just launched in January, a new educational aspect of amateur radio is being born. AMSAT Brazil (BRAMSAT) has commissioned one of the MicroSats and dedicated it for educational use. Starting mid-February, the DOVE (Digital Orbiting Voice Encoder) MicroSat will transmit 2 meter FM digital voice signals on 145.825, including telemetry and special purpose voice transmissions. The first major use to which DOVE will be put is to circle the world, speaking messages of peace written and spoken by school children.

Schools around the globe were invited to participate. In support of DOVE educational activities, I invited all radio amateurs to encourage their local schools to become involved in this creative writing exercise. Children from the ages of 8 to 18 submitted messages as a school project. Then, each school selected the top 20 messages and had the children record them for digitization and transmission to the satellite. Messages not in English are followed by an English translation. During its ten minutes or so above the horizon on each pass, DOVE will alternate message and telemetry cycles. Messages will be updated periodically. Children monitoring DOVE in its polar orbit will get a global perspective of peace as seen through the eyes of children from many lands.

To involve your local school in this project, write for the "Project DOVE Educator Letter" to:

DOVE Newsletter
c/o Doug Loughmiller
620 Fairway Drive
Paris, TX 75460

The AMSAT Educational News is available by subscription. A 10-issue yearly sub is $5 US, $7 Canada, $10 Overseas, from AMSAT, P.O. Box 27, Washington, D.C. 20044.

The future of amateur radio lies in the hands of today's youth. Through ham radio experiences with satellites, our youngsters can gain a better understanding of the science and technology needed to explore space, and of how that technology can be used in an exciting hobby that will truly bring the world into their classrooms.

Extending the Range of the Ramsey HR-4

Go further on your 40 meter receiver for less than $4.

by Mike Gray N8KDD

I bought an HR-4 40 meter receiver kit intending the project to be a learning experience for my nine-year-old son. After getting it together, we discovered that it covered only a small portion of the 40m band. I found that it was able to tune only 64 kHz in the available 300 kHz, without adjusting the slug in transformer T2. Additionally, the maximum frequency tunable with T2's slug screwed all the way down was 7.256 MHz. This article tells you how to extend the receive coverage of the HR-4 to the whole 40m band.

Varactor Tuning

We wanted a method of tuning the whole band, without adjusting the slug in T2 and without losing much resolution (see Figure 1).

Tuning is accomplished by adjusting the reactance of a diode, as a function of reverse bias voltage. The diode supplied with the kit was a 1N4002. The diode being the easiest and least expensive component to replace, I decided to experiment with different types of diodes from my junk drawer. I didn't really want to buy a diode designed for this purpose if another would work as well.

Diode	Lower	Upper	Delta
1N4002	7.192	7.256	0.064 MHz
1N4004	7.095	7.210	0.115 MHz
1N4742	6.780	6.993	0.213 MHz
1N4744	7.006	7.161	0.155 MHz

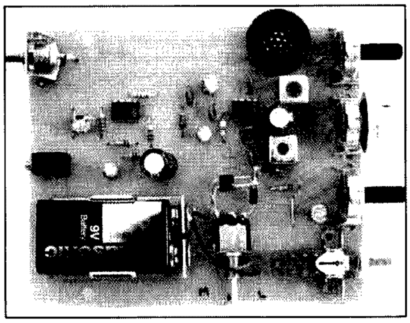
Table 1.

Experimentation

The first thing I did was insert several different diodes (one at a time), and measure the high and low frequency without adjusting the slug in T2.

From these results, shown in Table 1, I chose to replace the 1N4002 diode with a 1N4004 and listen awhile. Although the tuning range was nearly doubled by replacing the diode, and selectivity (resolution) did not seem to be a problem, it still would not tune the entire band, nor would it reach 7.300 MHz.

I had to drill a hole in the circuit board in order to screw the tuning slug in T2 down a few more turns. The slug needed only a couple of turns for the oscillator to reach 7.3 MHz, and I could get the same results by lifting T2 from the board slightly before soldering.



The HR-4 40m receiver.

Results of the Parallel-Diode Experiment

Switch	Coverage	MHz	Delta	1N4004
High	7.200	7.312	.112	one diode
Medium	7.101	7.265	.164	two diodes
Low	6.800	7.231	.431	three diodes

Amateur 40 meter band, 7.0–7.3 MHz

Table 2.

Replacing the varactor diode increased coverage, and adjusting the tuning slug in T2 allowed tuning the upper end of the band. I still could not tune the entire band without adjusting T2. Slug adjustment is not possible when the receiver is housed in a case, and it's not easy out of the case.

Experimenting further, I found that 2 diodes in parallel reduce the oscillator frequency and extend the coverage (see Table 2). Because the oscillator was already tuned for the upper end of the band, the selection of additional diodes makes a lot of sense. And it's easy to do with a toggle switch mounted on the front panel. My son plans to use this radio in a science project, so we glued the switch to the circuit board, rather than mount everything in an enclosure.

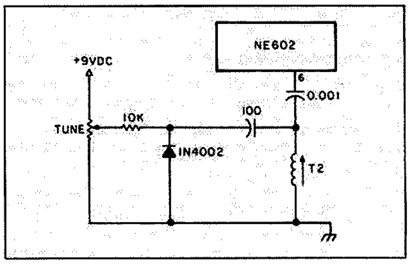


Figure 1. The original HR-4 tuning circuit.

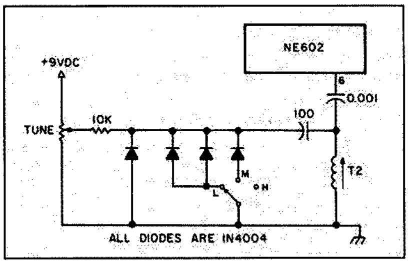


Figure 2. The HR-4 tuning circuit modified for greater coverage.

Solution

In addition to drilling a hole beneath coil T2, I modified the kit further, adding a few more diodes and a switch (see Figure 2). I chose a 1N4004 because it has nearly double the coverage of the 1N4002, and I had a whole package of them. If I weren't so lazy or cheap, I would use 1N4002 diodes for better resolution and less overlap in each band segment. I might also add more diodes in parallel in order to listen in well below the amateur band.

The kit is easy to assemble, and the circuit board sufficiently large to accommodate other components. It's a rewarding project, and provides an ideal platform for experimentation and education in radio principles.

The HR-4 receiver is available from **Ramsey Electronics 2575 Baird Rd., Penfield NY 14526.** The kit is reasonably priced at $24.95, and the optional enclosure is $12.95. 73

Mike Gray N8KDD may be contacted at 465 W. Maple Rd., Milford MI 48042.

The UNI-8 Porta-Power Adapter

Taps power from a variety of sources.

by J. Robert Witmer W3RW

Have you ever been in the middle of a QSO and had your FM portable battery go, and you without a spare? Ever think about the need to provide power for your FM portable for an extended time, from a variety of locations, and possibly during a public service activity where you may not have access to a charger for your NiCds?

The typical solution is to get a special power adapter for the cigarette lighter of your car, or for 120 volts AC. This approach is reasonable, provided you're near a cigarette lighter or a 120 volt AC outlet. But what if you're not?

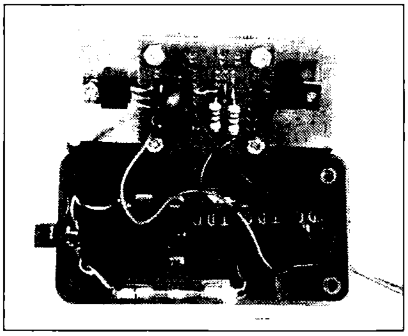
That's where the UNI-8 comes in. It converts power not only from the above sources, but also from AC/DC wall adapters designed for different applications. In addition, you don't have to worry about the polarity of your source, or whether it is AC or DC. The UNI-8 can handle them both!

I have used the following power sources with the UNI-8: the AC wall adapters for the Bearcat 580XLT scanner (13.8V DC at 700 mA) and the Bearcat BC-200 scanner (14V DC at 480 mA); the Radio Shack Archer AC wall adapter (RS 273-1652A, 12V DC at 500 mA); DC power cord for the Dynascan Model RD-3110 dual band microwave receiver; and the ICOM CP-1 power cord for the the IC-xAT and IC-0xAT series HTs.

Internal Details

See the schematic. Both sides of the input power lines are fused by F1 and F2, preventing the possible bypassing of a fused power line. Depending on the grounding scheme of the vehicle you are in, and the ground polarity of your FM portable, a bypass of the fused line could occur through the antenna coax line shield ground.

With the full-wave bridge rectifier, U1, the UNI-8 can operate from AC and DC inputs. Internal rectifier diodes to the + and − output terminals of the bridge steer the DC inputs, regardless of the input polarity. AC inputs are rectified and the unfiltered DC output is also presented at the + and − terminals.



Inside the UNI-8. The box has to be big enough for the electrolytic capacitor.

Following the bridge rectifier is the main filter capacitor, C1. This capacitor determines whether half-wave AC inputs can power the UNI-8. The half-wave inputs normally have 60 Hz ripple components from hard to smooth. The UNI-8 will work better with a high value of capacitance. Though nothing can totally compensate for a low input half-wave AC voltage, a large capacitance will help. The 7808 provides additional filtering, the amount depending on the ripple frequency of the rectified AC—60 dB of ripple rejection is typical at 120 Hz. The higher the frequency, the higher the ripple rejection.

U2 is the heart of the UNI-8. An 8-volt output was chosen for this adapter because of the need to provide operation from a variety of power sources. 8 volts seems to be within the range of most FM portables for operation at a reasonable level of transmitter power (see Table 1). Also, the regulator needs approximately 3 volts of "headroom" to regulate properly. Diode D1 protects U2 from output short transients. Capacitors C2 and C3 prevent spurious operation of the regulator.

Table 1.

HT	Power out	Operating Voltage
ICOM IC-2AT	1–2 W	7–11 V DC
Yaesu FT-727	½W, 5W	6–15 V DC
Yaesu FT-411	½W, 5W	5.5–15V DC
Kenwood TH-215A	5W	7.2–16V DC

The over-voltage protection section, consisting of D2, Q1, R1 and R2, was taken from an earlier power adapter article by Raymond Charland, "From Cigar Lighter to 9.6 Volts," in the April 1981 issue of *QST*. Two other references you may wish to look up are Peter O'Dell's "The Perfect 10," in the March 1984 issue of *QST*, and Motorola's "Voltage Regulator Handbook," published in 1976.

This section protects the FM portable in case U2, which has internal short circuit and over-temperature protection, fails. If U2 presents the full nonregulated voltage at the FM portable, the latter may not survive the experience.

If the voltage exceeds 11.5 volts, the triac (Q1) conducts, essentially shorting the output. This in turn causes F1 or F2, or both, to open, shutting down the input supply.

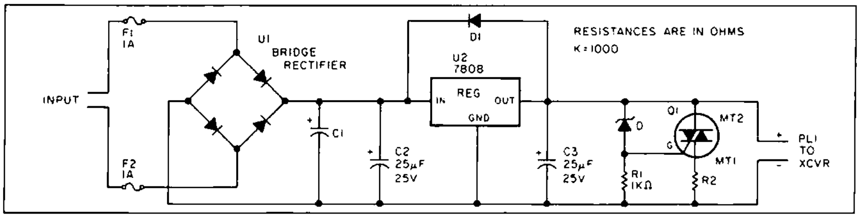
D2 determines the trip voltage. If 11.5 volts exceed the safe operating voltage for your FM portable, choose a zener with a lower zener voltage.

Watch Your Output Polarity

The input connector for the UNI-8 is a female coaxial type, Radio Shack 274-1565, designed to accept the mating connectors of most common power adapters.

I mounted the components for my UNI-8 in a plastic box with a metal cover, Radio Shack 270-231. Be sure to obtain a box big enough to contain the electrolytic capacitor you plan to use for C1. The holders for F1 and F2 (Radio Shack 270-739 or equivalent) and U1 were mounted in the bottom of the box. J1 is mounted to the side of the box. All other components, except C1, which fits inside the box, are mounted on the metal cover which provides heat sinking for U2. Capacitors C2 and C3 should be mounted as close as possible to U2.

Prepare an output power cord with a suitable mating connector to connect your FM portable to UNI-8's output. Be sure to double-check



Schematic of the UNI-8 power converter.

Table 2. Parts for the UNI-8

C1	4700 μF, 35V electrolytic cap.	RS 272-1022*
C2	22 μF, 35V cap.	RS 272-1014
C3	15 μF, 25V tantalum cap.	or same as C2
R1	1kΩ 10% ¼ W res.	
R2	Two 10Ω 1W resistors, in parallel	RS 271-151A
U1	Bridge Rectifier, 100V 1.4A	RS 276-1152
U2	7808, 3-terminal 8V fixed regulator	JDR*
Q1	400V, 6-A Triac	RS 276-1000
D1	Silicon diode, 1A 200 PIV	1N4003 or RS 276-1102
D2	11.5-V	1-W Zener diode
F1, F2	1.5-A fuse	RS 270-1274
J1	Coaxial power jack	RS 274-1565

* RS: Radio Shack; JDR: JDR Microdevices, 110 Knowles Dr., Los Gatos CA 95030

the polarity of this connection. All the protective circuitry in the UNI-8 can't protect your FM portable if you get the output polarity wrong!

Make a Spare, Too

The UNI-8 can convert power for your FM portable from various sources. Ideally, you need a supply with a minimum output voltage of approximately 12 volts, at a current level that will meet the demands of the operation intended. The maximum input voltage rating of the 7808 is 35 volts, so I wouldn't advise applying more than 25 volts to the input of the UNI-8. The over-voltage protection triac, Q1, is rated at 400 volts. If you accidentally apply more than 35 volts and U2 blows, Q1 should protect your FM portable.

"The UNI-8 can convert power for your FM portable from various sources."

If your adapter cannot supply adequate power for normal transmit operation, try the low-power position. A "hum" on your signal usually indicates inadequate filtering or current capacity. If that fails, try using the adapter for supplementing your receive operation. You could also try charging your NiCd pack.

This adapter gives you potential power for your FM portable from many power sources. It's easy enough to experiment! Construction cost is low enough for you to build two. Keep a spare UNI-8 in the trunk of your car for emergencies! 73

Bob Witmer W3RW, 146 Forest Trail Drive, Lansdale PA 19446.

Number 9 on your Feedback card

HAM PROFILES

There are no "average" hams!

Photo A. Chris Mignemi KB2IGF says he's met some of the most influential people in his life through amateur radio.

At the "CQ All Schools" Net

Chris Mignemi KB2IGF is 13 years old. He's in the 8th grade at Intermediate School 72 in Staten Island, New York. He received his Novice license when he was 12 years old and in Carol Perry WB2MGP's class.

"It was the most exciting day of my life," says Chris.

In addition to being on 220 and 10 meters, Chris is interested in model building and in music. "I want to fly planes in the Navy when I grow up," he says. "Ham radio was responsible for getting me interested in radio communications and for helping me meet people who influenced my career choice."

Chris can often be heard on the "CQ All Schools" net on Tuesdays and Thursdays on 28.303 MHz at 1730 UTC which operates out of his school. (Submitted by Carol Perry WB2MGP.)

KC9RP Hap Holly

Hap Holly KC9RP, born Alanson Perry Holly, a professional musician and graduate of Principia College, earned his ham license at the age of 14. He studied music under the legendary accordion virtuoso, Leon Sash. When he was a camp counselor in the Colorado Rockies, Hap met his wife-to-be, Stepahnie KA9WKD. Although he has been blind since the age of 7, he has climbed five mountains in Colorado, including the 14,435-foot Mt. Elbert. Can you imagine him rapelling? Well, he's done it. He has also rafted on white water rapids.

Hap is the former president of the Bear Repeater, and the Executive Director of the RAIN Foundation, a not-for-profit educational organization dedicated to the production of amateur radio programming. At 38, Hap is also a serious songwriter whose songs will be featured in a forthcoming album by Melissa Manchester.

Incidentally, Hap's Dad was a practicing architect and a writer. And as fantastic as it sounds, both Hap's mother and father were also blind. (Submitted by Angelo Polvere KA9CSO.)

Photo B. Hap Holly KC9RP, blind from the age of 7, enjoys music and adventure as well as hamming.

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

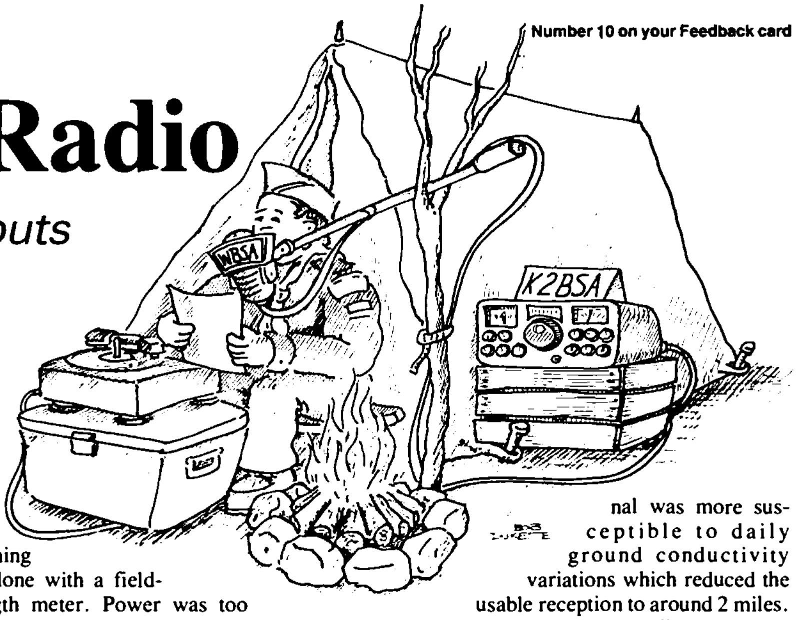
Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

Jamboree Radio

WBSA, K2BSA: Ham Scouts Broadcast Legally

by Kevin Scott WB4BNU



The Boy Scouts of America go all out every four years with a National Jamboree. At Bowling Green, Virginia, the latest Jamboree attracted 35,000 Scouts from the USA and 30+ countries. Adult leaders, staff, and daily visitors swelled the attendance to over 100,000!

Each year amateur radio K2BSA plays a role in the Jamboree, with a lively crew that shares the excitement of ham radio.

This year the Jamboree had a historical first. Broadcast Radio Station WBSA signed on and broadcast through the entire Jamboree. With an experimental license granted by the FCC, the BSA National Council operated on 530 & 1610 kHz AM and 91.7 MHz FM. 530 AM broadcast Jamboree and parking information on a looped cassette while 1610 AM and 91.7 FM were simulcasts—with live music, interviews,news, DJs and special programs. Live remote broadcasts via 2-way radio at key locations really caught the Scouts' attention, especially when there were prize giveaways. Schedule changes, news flashes, important last-minute announcements could all be broadcast quickly.

The FM station was easy to put on the air. We had ample trees from which to hang a ground plane antenna. Antenna height was around 45 feet. With 10 watts, its range was 5-6 miles. The fun part: Planning and building the AM stations. With low power (5 watts) we had to cover a 3-mile radius with signal enough for small portable radios. Every ounce of power was needed. Ham QRP know-how came in handy.

The FCC rules the length of the antenna system may be no longer than 49 feet: antenna, transmission line, and connection to the ground system—with a maximum field strength spec we could not exceed. Licensed for 10 watts, we had 5 watt transmitters.

To radiate as much of this as we could, we laid out a radial system that would be the envy of most hams. Nearly 2 miles of electric fence wire was used to make 2 radial systems with 120 fourty-four foot length wires in each. Several radials from each antenna overlapped to increase the effective ground plane under each antenna.

The mast used for 1610 kHz was forty feet of thin-wall fence pipe. Being flimsy, it was a pain to erect. Ham/Boy Scout ingenuity: throw a rope over the branch of a nearby tree and using it as a crane to hoist the mast, guy it in place.

Tuning was done with a field-strength meter. Power was too low to read on our SWR meter. The antenna first tried was a three-wire vertical unipole. I'd hoped its higher impedance, compared to a loaded ground-mounted vertical, would result in a more efficient radiator. I never found out. I couldn't find the match point and ran out of time. The signal strength was so poor the design was abandoned for something easier to tune. Outer legs of the unipole were tied together to make a vertical with a capacitive hat, which we fed to a link-coupled matching network. Performance was better than the unipole but far from ideal. Finally a tapped coil was tried with excellent results. Wound on scrap 2 x 2 using electric fence wire, it was 3' long with 100 wide-spaced turns. It didn't have inductance enough for a match, so a coil of 40 turns was wound and added to the end, of which only 25 turns were needed for a match. At only 5 watts, I got a few RF burns on my hand during the tuneup so I knew we were radiating something.

For the 530 station, the idea of erecting a mast was abandoned because it was such a pain to erect the one for 1610.

Since trees were plentiful, we took advantage of a tall one to erect a wire antenna with a capacitive hat. What I learned from the 1610 antenna, I copied for 530 kHz. It took 2 Scouts over an hour and several hundred feet of wire later to come up with another coil also wound on a scrap 2 x 2. This time we used insulated 20 gauge wire, closed spaced with a coil over two feet long! Even that wasn't enough. Forty additional turns were added to the end of the coil which proved to be enough for a good match.

I thought the tapped coil would be one of least efficient of the antenna designs, but efficient or not, it more than did the job and was easy to tune. Field tests by car and by bicycle proved that we provided a good signal even in the most remote locations of the camp. The audio quality was quite good. Range for a listenable signal on 1610 was around 3 miles and initial tests on 530 kHz yielded 5 miles. A good soaking rain helped the signal due to increased ground conductivity. The 530 signal was more susceptible to daily ground conductivity variations which reduced the usable reception to around 2 miles.

Both antennas did quite well despite their calculated radiation resistances of 7 ohms and 0.8 ohms!

So for the first time the National Boy Scout Jamboree had its own radio station! Based on its success, it won't be the last. Next time I think we'll just stick with two 10 Watt FM transmitters. They're much easier to put on the air and provide good, clean audio with a more reliable signal for the area concerned. The AM stations were a challenge! Next time, in true Scout fashion, we'll "Be Prepared."

You Can, Too!

This project can be done on a smaller scale in your community. Non-licensed broadcasting on the AM band is legal using a 100 mW input power transmitter into a 10 foot long antenna. Typical range is 200 to 300 feet. Buried or "leaky" coax is another approach. The FCC has maximum field strength specifications for both.

Typical applications? Travelers Information Service (TIS) for civic events, church services, hamfests. Parking information, descriptions of events for curious people driving by. "Live" broadcasting. Yard sale? Put a transmitter and antenna out by the street. You'll get a kick out of the comments. It may get people to stop who would have driven on.

Legal QRP AM can be an opportunity for Amateur Radio to provide the skills needed to set up a public service project in your community and make it work!

I want to thank the crew of WBSA who helped construct the station, and Panaxis Productions for helping with the transmitter plans and parts.

Wait til next Jamboree. WBSA-TV???

Kevin Scott WB4BNU has been a ham since he was 15 years old. He has a BSEE from the University of Florida. He presently works for a two-way mobile radio manufacturer in Raleigh, North Carolina, as a Test Systems Engineer. WB4BNU is also an active member of the Boy Scouts of America and the Order of the Arrow. Contact him at 1502 N. White St., Wake Forest NC 27587.

Time Division Multiplex

A bandspace-economic mode for possible use in ham radio.

by Bill Tipton W4TAL

With increased crowding on many of their bands, hams have been looking for ways to make spectrum use more efficient. One approach is to make signals more narrow band. For voice modes, single sideband (3 kHz wide) accomplished this by reducing the required bandwidth by half over AM (6 kHz wide). Another approach is for signals to share a channel. Packet radio does this with much success—such systems monitor a channel and wait until it is clear before transmitting.

Intro To TDM

This article presents the reader with the basics of TDM technology. It describes the TDM process, how it's used, the characteristics of the TDM digital carrier, and the advantages and disadvantages of TDM.

Time Division Multiplex (TDM) represents the latest efforts to economize on bandspace. Like packet, TDM is a method of digital communications that allows a number of voice or data channels to use the same path or circuit. Two main differences, however, exist between packet and TDM. First, since TDM is synchronous—that is, it depends on a precise timing element—much more efficient time-sharing can exist on a frequency. Second, TDM takes analog voice channels and converts them to digital, whereas packet takes digital input from a keyboard or program, and converts it to analog tones for transmission.

So far, TDM is used mainly in the telephone digital carrier network. TDM is also used in satellite communications by means of a technique called Time Division Multiple Access (TDMA).

Some Telephone Basics

The telephone in most homes or offices is an analog instrument. It's connected to the telephone network through a two-wire line to the telephone company's local office. This wire connection or telephone circuit is designed to handle voice or data frequencies in the range of 0–4000 Hz (the human voice typically ranges between 500–3000 Hz). That is the bandwidth of the circuit. This two-wire cabling is usually called *twisted pair*.

Each telephone circuit is a single path for one voice channel. At short to medium distances of circuit connection (between cities, two central telephone offices, etc.), channels can be digitally combined. That is, the voice signal is converted from an analog to a digital form before entering the circuit. Digitized signals can be easily stored and very quickly retrieved to feed into a circuit in small discrete units, when there is space for them. This way, a number of signals "time share" a single communications path.

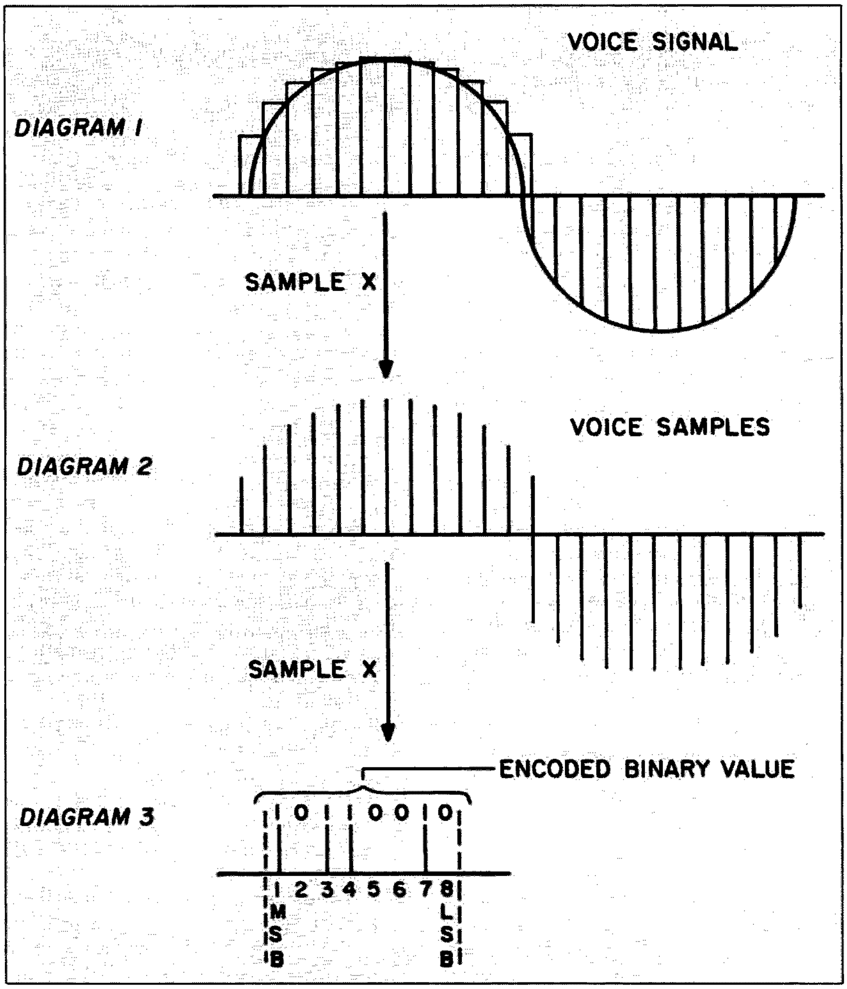


Figure 1. The TDM process. The first diagram shows the voice signal. The second diagram shows the approximated image of the voice signal, composed of sampling pulses. The third diagram shows a given sample pulse being awarded a binary value.

To perform this time-sharing feat, each voice channel has to be sampled often enough so that the voice intelligence is reproduced reliably at the receiving end of the connection. Sampling is just the process of taking a "snapshot," at a given frequency, of an analog signal, and assigning that snapshot a value. Based on the Nyquist sampling theory, if sampling is done at a rate twice the bandwidth of the voice channel, the intelligence in the voice signal is preserved. By sampling the voice circuit 8000 times a second (2 x the bandwidth of the telephone circuit) the TDM process begins.

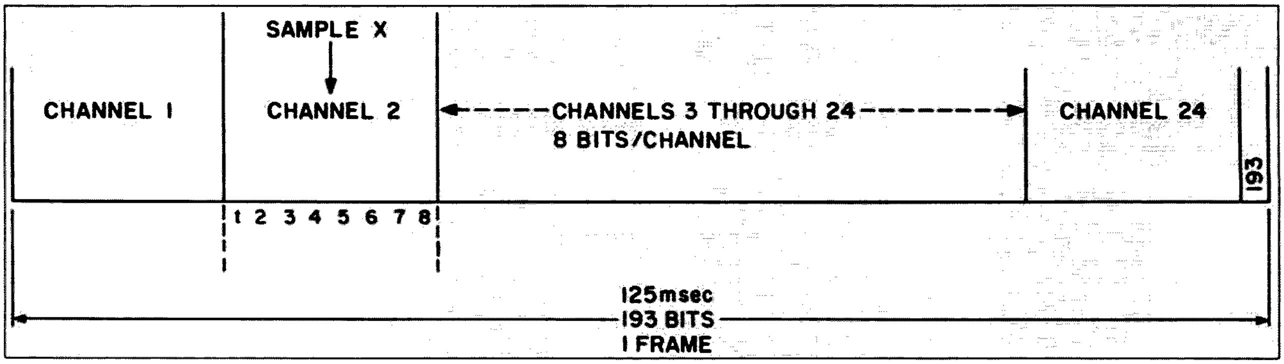


Figure 2. Schematic representation of a TDM frame. The 193rd bit is a synchronization bit.

One Line For 24 Voice Signals

See Figure 1. Each voice channel (telephone circuit) to be multiplexed is sampled (Diagram 1) and a pulse amplitude modulated waveform is produced (Diagram 2). For simplicity of explanation, a sine wave representing the voice channel information is shown.

Each of the variable amplitude pulses in Figure 1 represents a sample of the voice channel information. Each sample represents some quantity, either positive or negative, based on its position in the waveform. The value of each pulse can be approximated by an 8-bit binary number. Since the binary system has a base of 2, there are 2^8 or 256 possible values.

In practice, the left-most bit of this number (the Most Significant Bit, or MSB) represents the polarity of the pulse. This leaves 2^7 or 128 values possible. The assignment of approximate values to each pulse is called "quantization." Quantization is the process by which the range of values possible for a pulse waveform are subdivided into a finite range of values, one of which can be used to represent the value of that waveform. Even though quantization approximates pulse values, these approximations are close enough to the true values to preserve the voice information. Once quantized, the value of the pulse is encoded into an 8-bit data word.

The 8-bit digital samples of each voice channel are produced at a rate of 8000 times a second (the sampling rate). Therefore, each voice channel becomes a 64,000 bits per second (8000 x 8) digital signal.

Next, a number of these voice channels are placed together (multiplexed) into a single communications path. In the process, timing and synchronization ensure that each voice channel is identifiable. This multiplexing of the voice channels into a single communications path creates a TDM digital carrier.

The Digital Carrier Network

The telephone digital carrier network in the US is called the T1 digital carrier system. At its lowest level is the DS-1 (digital signal – 1) carrier. The DS-1 consists of 24 digitized voice channels multiplexed into a 1.544 Megabits per second digital carrier. Each of the 24 voice channels is time sequenced (#1 through #24), and one bit is added for timing and synchronization to produce one "frame" of data. The frame of data contains 193 bits [(24 x 8) + 1]. Since there are 8000 samples, the carrier bit rate is 1,544,000 bits per second (8000 frames x 193). This structure is depicted in Figure 2. There are higher levels of multiplexing within this system, but they are beyond the scope of this discussion.

The voice channels for the DS-1 are produced from 24 selected voice circuits input to the TDM conversion device. The electronic switching of phone circuits in a telephone office selects the voice channels. This switching is based on a need for circuits and calls in progress at the time.

The conversion device is usually called a "channel bank." It performs the sampling, analog-to-digital conversion, quantization, encoding, and multiplexing process, to produce a DS-1 digital carrier for transmission. To receive, it reverses this process.

The 193rd bit within the frame provides a recurring bit pattern which allows synchronization of the TDM carrier. With this, the conversion device is able to determine the start of the frame. Without some method of identifying the start of the frame, it's impossible to retrieve information from the frame in proper sequence, or even identify individual channels. In addition, this bit pattern (at some time during its timing sequence) provides information as to when the voice channel contains information about the condition of that circuit. The condition of the circuit refers to its status—on-hook, off-hook, and ringing.

Advantages and Disadvantages of TDM

The use of digital techniques in communications has grown since the late '60s. Microprocessors and digital integrated circuits have made the conversion economical, efficient, and simpler. TDM is part of that process. In the future, we can expect the telephone handset itself to do the digital conversion for the telephone network. For now, however, the primary disadvantage of using digital processes such as TDM is the cost of interconnecting it to the analog portions of the telephone network.

Soon to Amateur Radio?

Integrated circuits are available that encode 8-bit digital voice or data into DS-1 bit stream, and decode DS-1. All these ICs work at the digital level and require highly accurate 1.544 MHz clocks for timing. Main users of TDM are large telephone and satellite communication networks, where large economy-of-scale exists. The prices of digital components are falling daily, however, so it may soon be economically feasible for the amateur community to exploit this mode. ■

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Ground Rules of RF Building

Valuable guidelines for printed circuit board design for RF circuitry.

by Bob Lombardi WB4EHS

Newcomers to building RF circuitry always seem a little scared by tales of seeming black magic, such as when you fix a horrible oscillation by repositioning a wire or component. When I first got involved with RF engineering, I heard some of the old hands at HF say that you could get away with almost anything under 30 MHz. Some time later, I remember overhearing some technicians say you could get away with anything below 500 MHz.

When I got my first 2 GHz assignment, I was told that I could get away with almost anything below 3 GHz. About that time, I saw one of the technicians carve a bandpass filter for 10 GHz out of double-sided Teflon™ PC board. When I expressed amazement, he said (you guessed it) you can get away with almost anything below 14 GHz.

How Can You Get Away with It?

Obviously that expression meant something different to each person using it. The HF guys would include, for example, running fairly high-level signals on hook-up wire, or using a half-inch lead to a bypass cap. To the microwave guru, it means not having to etch a new version of his filter every time he wants to change a parameter. The microwave guy would never consider using a capacitor with leads. The HF expert may not even recognize the microwave filter when he sees it.

What determines when you can get away with a given technique? What causes you to have trouble? Here are some proven RF prototyping techniques used around the world every day that can help you build projects at any frequency you want.

First, Look at Length

The first thing that gets you in trouble is the electrical size of the part or the length of the connection. The distinguishing feature of UHF and microwave circuitry is that the components become a significant portion of a wavelength long. My rule of thumb for "significant" is anything longer than 1/10 of a wavelength. Some people say 1/20 of a wavelength.

This explains why a 2" piece of #20 wire is a perfectly good lead at 30 MHz, but is absolute hell at 3 GHz. At 30 MHz (10 meters), 1/10 wave is 1 meter (39.370") and 2" is very short. This lead is only 1/200 of a wavelength. At 3 GHz, however, 1/10 wave is 0.3937". A 2" lead at this frequency is comparatively very long, over ½ wavelength!

To compound things, when the wire is etched onto a PC board, the electrical length of a 2" conductor is even longer, since the velocity of light in the board material is lower than the speed of light in a vacuum, and the electrical length of a wire depends on the speed of light in the medium. To connect two points at 3 GHz, some form of transmission line is required, such as coax. *Remember to think in terms of wavelength when you consider whether something is long or not.*

Watch Out for Stray Reactances

Inductance is the property of any circuit that causes energy to be stored in a magnetic field; it is most easily seen in pieces of wire. Coiling the wire increases the amount of inductance in a given volume, and makes the component more compact. Likewise, capacitance is the property of circuits that cause energy to be stored in an electric field: it is most easily seen in a parallel plate structure. Ceramic and electrolytic dielectric capacitors are specifically designed to increase the amount of capacitance in a given volume, but you'll find some capacitance wherever two conductors come near each other.

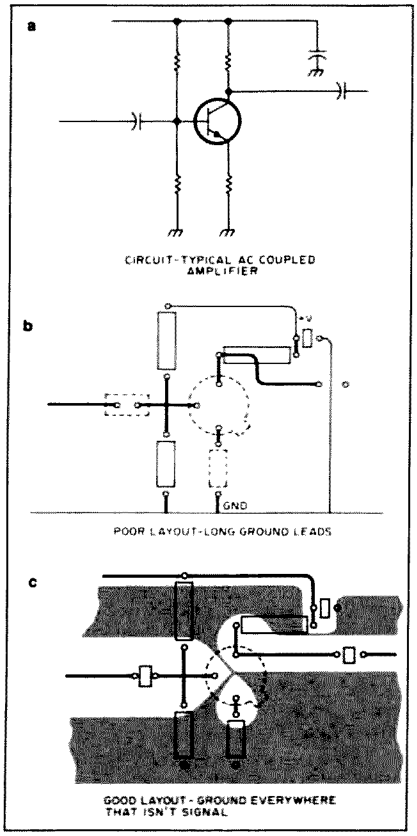


Figure 1. (a) Typical AC coupled amplifier circuit. (b) Poor layout. Notice the long ground leads. (c) Layout with lots of ground. Ground is everywhere except for signal leads.

A cap with long leads will appear to have inductance in series with it, thereby forming a series LC circuit. For the typical leads found on small ceramic or silver mica capacitors, I figure around 28 nH per inch of lead (about the same for #22 wire). This means that a 0.01µF cap with two leads 1/16" long will appear to be series-resonant at around 27 MHz. Beyond that point, the capacitor behaves as an inductor.

You should be aware of this if you want to use one to couple or bypass higher frequency signals. The inductive reactance goes up with increasing frequency, and the part that you wanted to be a short circuit is now a larger reactance. The way around this is to use smaller values, or to reduce lead length by surface mounting the cap.

Although this gives you almost zero lead length, the inductance of the cap has not gone to zero. The physical size of the cap—the actual area of its plates—contributes inductance. All capacitors display this effect, and getting around it is an important part of millimeter wave (higher than microwave) design.

By the way, remember that 2" wire at 3 GHz? Another reason it presents problems is that it, too, represents about 30 nH per inch. You probably have seen that the inductive reactance of a coil goes up with increasing frequency. The lead mentioned above offers 565Ω reactance at 3 GHz, which is probably much too high for your use.

Likewise, an RF choke (or any coil) has capacitance between its turns, and this looks like a parallel cap that gives a very real resonant frequency. Unfortunately, I can't give you a handy value to calculate with, like above. Coil manufacturers generally provide the resonant frequencies for their coils. Parallel resonance is more likely to be acceptable in an RF choke, since it increases the resistance to the RF you're trying to choke off. You don't want it in coils used in transformers or filters, though, because the effective inductance of the coil increases sharply as you approach the resonant frequency. Limit coils in filters to 1/10 or 1/5 of their resonant frequency. Beyond resonance, the shunting capacitor passes more and more signal, while the inductor starts getting bigger again. The result is decidedly not an RF choke.

As nasty as these effects are, they are relatively well known. They've probably been accounted for in the design of the project you're building.

The Most Common "Gotcha"

What gets all of us, sooner or later? Improper grounding. Simply put, you just can't run all of your grounds on a single wire that branches out to all of your components. Though this is often done on perfboard, it only works on the simplest audio circuits. You can't leave a ground strip around the outside of your PC board and attach to it via etched traces. Both of these are common mistakes for the simple reason that each represents a lot of inductive reactance before you get to ground. That inductance can make the ground connections rather high in impedance, and the RF will seek a lower impedance path, usually where you don't want it.

What you want is the most ground that you can get. Use double-sided material (single-sided is harder to find, anyway) and keep as much of one-side solid copper as you can manage. Mount the components on this side, and relieve around the leads with a drill bit or countersink where you don't want a ground connection. There's no such thing as too much ground!

To briefly use a reduction to absurdity argument: If the entire board was one massive ground plane with no lands etched in it, there would be no oscillations, no stray coupling (such as a filter's input showing up on its output), and no crosstalk (such as when digital clocks running next to sensitive amplifiers cause sharp transients on the analog signal). Of course, there would be no circuit either. The point is that as soon as you start breaking the ground planes apart to put in the circuitry, you compromise your grounds. Leave as much there as you can. Don't be in a hurry to etch away copper that you think you don't need.

Every time I've ever seen a circuit where it was suspected that there was too much ground, what was needed was *more* ground, and better connections between grounds. (A friend with over 25 years as an RF engineer says he saw one case many years ago in which the grounds needed to be separated.)

In professional circles, it is widely acknowledged that the layout and packaging of an RF circuit has as much, if not more, influence on its final performance as the actual circuit itself.

All of this leads to what I'll somewhat immodestly call:

Uncle Bob's Handy Rules for RF Building

Follow these rule and you'll have fewer problems with your RF projects.

1. *Groundliness is Next to Godliness.* The more ground you've got, the better off you are. One side of your PC board should be solid copper, with signal traces there a last resort. This is your ground plane. You should have ground everywhere you can fit it. Connect top and bottom grounds frequently with short pieces of wire in drilled through-holes.

Only one caution applies: At higher frequencies, you may use microstripline, or coplanar waveguide, techniques. Don't crowd ground up against microstrip lines; leave a gap equal to at least one-and-a-half times the thickness of the board. The impedance of coplanar waveguide is set by critical spacing of ground and the conducting center trace. If you're building something with this, don't fool with line widths and spacing to ground.

This well-grounded board should then be mounted in a metal enclosure with its ground solidly connected to the chassis ground. If you're using AC power, I believe in the electrical code requirement that the line ground (the green wire) should connect to the chassis. Some writers say this is bad for lightning protection, and advise you not to connect to the AC ground. *Follow their advise at your own risk!* The commercial gear you buy will have this connected.

Finally, if you use the project in your station, you will probably want to connect it to the station's earth ground, although this is marginally useful for circuits operating above HF.

2. *Keep Outputs Away From Inputs.* Optimal RF layout is in straight lines, with input as far away from output as you can get it. The higher the gain of the circuit, or the higher the "Q" of the circuit, the more this applies. If an output has to be near an input, keep as much ground as possible between them. (This is why the IF sections in radios are set up in strips.)

3. *Use the Smallest-Sized Components You Can Manage.* This reduces stray reactance in the circuits, and makes the design more realizable.

4. *Make Connections Short and Direct.* I don't care if it's prettier to have neatly laced wire bundles, and the circuit certainly doesn't. Short leads helps prevent stray inductance from causing trouble, and helps eliminate the need for coax runs. This especially applies to the inverting inputs of op amps and to high impedance circuits. Keep these lines short.

5. *Put Ground Between Lines That Run Alongside Each Other.* Especially if they run for any appreciable length. This is the best cure for crosstalk.

6. *Beware of Coupling Between Circuits.* A lot of ground will really help this, but it can still happen, especially with unshielded coils. Shield them, even though this reduces the "Q" of the coils, or use toroids. (If you absolutely can't afford to lower the coil "Q," it may help to reposition them so that their long dimensions are perpendicular.) Shields made of thin sheet metal are an industry standard method of preventing this.

7. *Bypass the Heck Out of Everything.* Every IC should have at least one cap from each power supply pin to ground. The value depends on the part, the frequency of operation in the circuit, and those around it. Start around 0.1 or 0.01µF for HF operation. Some parts, like monolithic voltage regulators, should have an electrolytic (including tantalums) and a small ceramic cap in parallel at the device body for bypassing.

Dead-Bugging It

You may have guessed from what has been said here so far that I'm a big fan of PC boards for building. Not true. For one-time projects, or for most work under 200 MHz, I don't generally make PC boards.

What I usually do is called "dead-bugging" or "dead-roaching." These colorful names comes from the fact that ICs are generally laid on their backs onto a solid sheet of ground plane, typically a piece of unetched PC board material, with their leads sticking straight up into the air. They really do resemble dead bugs. All connections are made directly to the pins using the leads of the components being soldered in.

If necessary, large-value (over 100k) resistors can support low impedance points, such as at op amp outputs. Circuits built this way are very easy to modify, and are usually quite compact. If you keep the signal paths close to the ground plane, under a quarter inch, the circuits generally perform well. Place the components like a well thought out schematic would show them, then progress from input to output, left to right.

How well does this work? Any method used as widely in industry as this must work well, and indeed it does. In fact, we often encounter problems in going from the first dead-bug prototypes to a PC board because the board doesn't have as good a ground plane. I have run tests comparing etched and dead-bug versions of the same circuit, and the dead-bug version will equal or out-perform the etched version every time.

Another method is making a PC board, using a craft knife, such as X-Acto™, to cut around lands you want to remain on the board, and then removing the undesired copper, either by heating up a corner and peeling it off with needle-nosed pliers, or by using a hand-held grinder (Dremel, or Weller, etc.). I have frequently used this method to build microstripline circuits and filters; it works quite well. A former co-worker referred to these as my scratch-and-sniff filters. Be careful; wear safety glasses and keep your other hand clear. The tips of the blades can and do snap off, and the blade can and will slip. I value my eyes and fingers, and I bet you do, too.

Last, various universal prototyping PC boards are available. They have their merits, but most are not suitable for use above a few hundred kHz. I'm not a fan or user of any of them.

So there you have it—a set of handy ground rules to build RF prototypes which should help you get started up through at least a couple of GHz. If you receive specific construction details with a project, follow them. If you don't, or if you're trying your hand at designing your own, then follow these. While I can't guarantee that nothing you ever build this way will ever oscillate, these pointers can help you a great deal in determining if it's the design or the construction that's the trouble. 73

Service Survey

Tips on getting good service for ailing rigs.

by Gordon West WB6NOA

What are YOU going to do when your rig goes up in smoke? Will you fix it yourself? Will you take it back to the dealer where you bought it and get it fixed while you wait? Or will you send it back to the factory and hope that you might get your set back within a few months?

How to Get Help

This service survey will be published in each issue of 73 through July 1990. It will be an eye-opener on how you can get your equipment repaired without frustration, and hopefully without a long wait. I will feature comments from hams who have experienced good service, and bad service, from both the factory and servicing dealers. This may help you decide where to send your set to get it fixed.

Here's the line-up for our monthly service survey:

March (this issue):	How To Get Better Service
April:	Kenwood Service Survey
May:	ICOM Service Survey
June:	Ten-Tec Service Survey
July:	Yaesu Service Survey

I have visited each factory personally, and documented the time involved in getting a particular type of transceiver fixed. I will include photographs of their service center, and the technicians that fix your sets. I'll include the names and numbers of key service administrators in case you want to go "to the top" to resolve a service problem.

Each month we'll take a close look at each company's service record. You will learn exactly what you need to do to get your unit fixed properly, how to estimate the time it will take to get it back to you, and how to approximate the cost of the repair work.

The Overall "Musts"

This month you will receive the combined input from all the service managers on how you can help yourself get better service. Kenwood, Yaesu, ICOM, and Ten-Tec all agree that there is plenty that you can do to up your odds in getting your set back quickly, and repaired properly, with a minimum of running around or frustration on your part.

Unanimous Tip #1: Is your problem an operational error? Let your factory-authorized dealer take a quick check of the rig to make sure that the problem isn't something simple, or something that can be quickly repaired on the test bench in the back of the shop. If there is no dealer near you, find a ham with the same type of equipment. The two of you should verify together that there really is a technical problem.

Unanimous Tip #2: THE FACTORY NEEDS DETAILS. If you plan to send your set back to the factory for repair, include precise details of what you find wrong with your unit: What did you observe that makes you think the unit is not working correctly? Too many times the factory's repair staff receive equipment sent back with a note saying only: "Please fix." Without more details, the factory may overlook a problem unique to your set. Please use the *73 Magazine* SERVICE REPAIR FORM to adequately describe the details of your particular service problem. All of the Service Managers that I surveyed agreed that this would be a good form to fill out and tape to any equipment returned to the factory.

Unanimous Tip #3: Many returned sets are damaged in shipment to the service factory. If you can't package your rig properly, then take it to a nearby package shipping center and let them pack it up in foam for you. All Service Managers agreed that lots of the equipment sent back to the factory was poorly packaged.

Kenwood Corporation will be the focus of our service survey for next month. We will take an inside look at their factory service counters and see what it takes to get a rig quickly repaired and shipped back to the ham waiting for it. We'll look at comments—some positive, some negative—from hams about the Kenwood repair cycle. Finally, you'll find out who the key personnel are in case you need to call the factory for a status report on a Kenwood fix at the factory. ■

Photo A. The Waiting Room.

Does the problem begin immediately, or a few hours after warm-up?

____

Does the problem occur continuously, or is it intermittent?

____

If intermittent, what conditions aggravate the problem? (Heat, vibration, low voltage, etc.)

____

____

What type of antenna are you running on this set?

____

____

____

What is the SWR? ________________________________

Date you have returned the equipment for repair. ________________________

What accessories are you returning with this repair? (Do not include any accessories unless you feel they might be part of the repair problem.)

____

____

Any other information that might describe the problem with your set?

____

____

____

73

Number 38 on your Feedback card

CIRCUITS

Great Ideas From Our Readers

Chicken Bandit Filter

Recently, one of my two meter friends was bothered by a nearby CB operator with illegal power and manners to match. I argued that it is better to filter than to fight.

The *Handbook* gives approximate design values, so I built a 5-element Chebyshev high-pass filter with adjustable capacitors to tune it for optimum performance. Past experience told me this is often critical; use low tolerance caps. The caps I used are Hammarlund APC types. You must have some measuring equipment to tell what you are doing.

If you want to look at the nominal design values, see filter #94 on page 2-48 in the 1987 *ARRL Handbook*. I recalculated these values, listed in the figure caption.

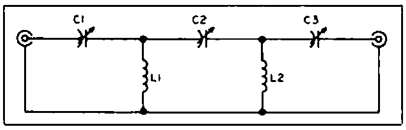


Figure 1. C1 and C3 are approximately 47 pF (75 pF ⅔ meshed); C2 is approximately 24 pF (50 pF ½ meshed). All three caps are Hammarlund APC types. L1 and L2 are 3 turns of #16 ¼" dia., ½" long. All this is built in a 2" x 2½" x 5" metal box, with coax jacks at either end and the coils mounted at 90 degrees to each other (one grounded to the side and the other to the bottom) to avoid unwanted inductive coupling.

This filter goes between the transceiver and the antenna. Of course, if the CB guy is running three kW, sterner measures may be required.

The theoretical rejection is in excess of 40 dB. I can't measure accurately that high, but with my bench equipment I can see 37 dB at least.

Set the cut-off frequency well above the second harmonic of the offending signal. C2 is extremely critical. Feed a transmitted signal through an SWR meter, through the filter, to a dummy load corresponding to the antenna you plan to use (50Ω) and tune C2 for lowest SWR. That should also be maximum output to the load. I can't measure any insertion loss. If you tune to the middle of the band you plan to use, this is a set-and-forget item.

Wm. Bruce Cameron WA4UZM
324 S. Riverhills Dr.
Temple Terrace FL 33617

73 Review

by Marc Stern WA1R

Uniden HR-2600

A beauty of a mobile rig!

Uniden Corp. of America
4700 Amon Carter Blvd.
Ft. Worth TX 76155
(817) 858-3300
Price Class: $490

We have an amazing hobby. Every new contact is as exciting as the first, no matter how long ago that was. Take 10 meters, for instance. Just the other day 10 was open as I cruised along a road near my house. As I tuned around on my 10-meter rig I heard Cyprus, Malta, and Ireland. Not being one to let an opportunity go, I called each station, and what do you know! They came back to me: Cyprus on the first call, Ireland on the first call, and Malta on the third. The amazing thing is that it was all done with 25 watts from Uniden's modest power level transceiver, the HR-2600, into a base-loaded, mag-mounted mobile antenna (Wilson's 1000).

The HR-2600 looks the same as its predecessor, the HR-2510. About the only way you can tell them apart is the HR-2510 label on the older model and the RPT setting on the front panel of the HR-2600. That's it.

What are the improvements on the 2510? Read on to find out!

The Uniden HR-2600.

Table 1. Uniden's Changes

HR-2510	HR-2600	Change
1. Transmit beep	No transmit beep	Beep gone
2. Public address (PA) function	No PA function	PA eliminated
3. Constant RIT	RIT control/switch	RIT can be disabled
4. Channelized operation; 10 kHz channels	No channelized operation	10 kHz channels gone; continuous tune
5. No repeater splits	Repeater splits	RPT button added
6. No CTCSS tones	CTCSS tones	CTCSS tones added

Major Changes

Table 1 shows what has been added to or eliminated from the HR-2510 to make the HR-2600. Let's look at each change briefly.

•Transmit beep: When the HR-2510 was first introduced it initiated a telltale annoying transmit beep whenever the beep button was pushed. I guess it was Uniden's way of trying to indicate an "over" signal for phone ops. This feature has been replaced on the 2600 by the repeater offset function.

•Public address: When the HR-2510 debuted, it had a public address capability. I guess you can tell its heritage, as most 11-meter rigs have that function, too (why, I can only guess). On the HR-2600, the PA function has been eliminated in favor of a real RIT switch.

•RIT control switch: When the HR-2510 debuted it was equipped with a continuously-tuned Receiver Incremental Tuning (RIT) circuit. The only problem was that unless you left it centered all the time, you couldn't really tell what the receive frequency was. There was also no indication of just how far away from your operating frequency the RIT had placed the 2510, and again, unless you left the RIT centered, you never really knew where you were. There was also no indication that the RIT was engaged at all times.

Several modifications were published to get around this problem, and Uniden responded. The addition of the RIT ON/OFF switch, in place of the PA switch, is an excellent change. The frequency display remains the same when the RIT is engaged, but you must physically engage the RIT control before it is activated.

Think about what this seemingly small change means. How many times do you think the owner of an older HR-2510 went to answer a CQ, only to find that the RIT had left the receive 2 kHz off the transmit frequency? Situations like this can be frustrating, especially if you're not "quick on the tune," so to speak. And, with 3 kHz bandwidth, it could become more than a little annoying on CW where most rigs use an 800 Hz or so offset. You could easily tune right through a CW signal and you never really could zero beat it easily.

Now, however, the RIT is defeatable—you can use the VFO to tune critically, and then use the RIT to fine-tune after you've homed in. You can really zero beat signals now. However, the display still remains the same; there's no indication of received frequency change.

•Channelized operation: When the HR-2510 debuted, it was immediately apparent that it came from a world of channelized operation. Frankly, it was little more than an 11 meter rig with a few changes. Granted, they were necessary changes—RIT, FM, CW and the like—but basically, the HR-2510 was still a converted CB rig.

Because the heart of the circuitry was originally a CB radio, it is easy to see why the orientation of the HR-2510 is toward 10 kHz channel spacing. CB is limited to 40 channels on 11 meters with an arbitrary 10 kHz spacing. Thus, when you tune the HR-2510 with either the buttons of the up/down, standard mike or with the up/down keys on the front of the rig, you find it tunes through 50 channels that are evenly spaced every 10 kHz. The VFO dial is the only control that will tune in any way other than 10 kHz steps.

The lack of continuous tuning with either the push-buttons on the front of the rig, or on the mike, made using the HR-2510 less than easy, especially for mobile operation. The HR-2600 fixes this problem by allowing continuous tuning with either the mike push-buttons or the up/down buttons on the front of the rig. Again, this feature was sought after by HR-2510 users, as fixes for it were published soon after the older rig was introduced.

Note, by the way, that Uniden still slices the 10 meter band into four band segments: 28.000–28.499, 28.500–28.999, 29.000–24.999, and 29.500–29.699. I can't fathom the reasoning behind this breakdown, except that the band segments do coincide with the Novice-Tech segment (28.000–28.499), international SSB window (28.500–28.999), satellite links and AM (29.000–29.499), and the FM/repeater window (29.500–29.699).

•Repeater splits: When the HR-2510 was introduced, it was loudly applauded for its standard FM, but more than one writer/observer

Table 2. HR-2600 Specifications

General	
Frequency Range	Band A28.0000–28.4999 MHz
	Band B28.5000–28.9999 MHz
	Band C29.0000–29.4999 MHz
	Band D29.5000–29.6999 MHz
Frequency Stability	±300 Hz Nominal
	(@25°C, 5 minutes after power on)
Microphone	500Ω Dynamic, PTT, UP/DOWN buttons
Speaker	8Ω, 5 Watts max.
Operating Modes	CW, USB, LSB, AM, FM
Display	Backlit LCD
Display Items	Freq., Band, Repeater Mode, Meter,
	Meter Mode, TX, VFO Span
Size	7.32"W x 10.35"D x 2.44"H
Weight	4 pounds, 3 ounces
Transmitter	
Output Power	CW, 25 watts
	USB/LSB 25 watts PEP
	AM/FM 10 watts nominal
Spurious Harmonic Emissions	−50 dB nominal, all modes
Carrier Suppression	−55 dB nominal, USB/LSB
Unwanted Sideband Suppression	−45 dB nominal, USB/LSB
Power Consumption	AM/FM 3 amps nominal
	USB/LSB 0.8 amps (no modulation)
	CW 5 amps (key down)
Power Consumption (maximum modulation)	AM/FM 3 amps nominal, USB/LSB 5 amps nominal
Microphone Input	1 mV nominal for 50% AM modulation
CW Key Voltage/Current	8 VDC, 10 mA
Receiver	
Sensitivity for 10 dB	AM 0.5 uV nominal
S/N	CW/USB/LSB 0.25 uV nominal
RF	Image Rejection Ratio65 dB nominal
Power Consumption	500 mA nominal
Squelched Power Consumption, Maximum Audio	1000 mA nominal

also noted the lack of repeater offsets. To operate on repeaters, if they weren't tone accessed to begin with, meant that you had to transmit on the input frequency, then turn the VFO dial until you were on the repeater's receive frequency. Or you could set the SPAN control—the control which tells the HR-2510/2600 series the tuning rate (100 Hz, 1 kHz or 10 kHz)—and then hit the "up" button on the mike or front panel 10 times. Either way, it was awkward. The HR-2600 fixes that with built-in repeater splits. Using the former beep button location, Uniden has implemented standard 100 kHz splits for repeater work, making the HR-2600 a pleasure to use on repeaters.

• CTCSS Tones: When the HR-2510 was introduced it lacked CTCSS tones, a feature many repeater operators have implemented. Given the crowded state of 10 meter repeater pairs and the fact that at this stage of the sunspot cycle communications is worldwide, repeater operators have opted to use CTCSS tones to help keep their repeaters quiet.

A 10 meter repeater near my home uses CTCSS, and implementing this option opened up a new world of operating for me. And it was easy to do! I just followed the clearly written instructions in the manual and flipped a couple of DIP switches. Suddenly, where I used to be limited to listening passively to the repeater, I could access it and use it. The CTCSS tones made a BIG improvement.

Essentially, the rest of the 25 watt rig has remained unchanged. It is still a multimode rig that puts out 25 watts on CW and 25 watts PEP on SSB. When you run AM or FM, the output is 10 watts nominal.

The Good, the Bad, and the Ugly

If you look closely at the specs (Table 2), you'll see that the HR-2600 is a very capable rig. The worst case of sensitivity is 0.5 µV, which is within the realm of other rigs of this type and, in fact, within the realm of just about every rig on the market. With 0.25 µV sensitivity on CW and SSB, the HR-2600 is just about as sensitive as any rig I own, although figures in the 0.15 range are also common in the HF world. Still, we're talking about orders of magnitude in price and selectivity.

That's right, selectivity. The more sensitive a rig gets, the more selective it has to become, and the HR-2600 can't seem to cope with several signals in the tuning passband. It tries to hear all of them at once and it begins to ring a little. However, when I put my Autek audio filter in front of the speaker, the problem cleared up and I was easily able to pick out signals.

Overall, I was quite pleased with the HR-2600. I received audio reports that were uniformly good, and signal reports that positively astounded me (worst case 5 and 4, which isn't bad for a 25 watt rig and a wildly swaying 60-inch whip). As I noted, the addition of the repeater splits, CTCSS, and a switch to disable the RIT, were also godsends. They added greatly to my enjoyment of the HR-2600.

I still haven't figured out the exact function of the MIKE GAIN control because it narrows the audio bandpass and attenuates outgoing audio. Instead of MIKE GAIN, I think it should read "MIKE ATTEN." Uniden would be well-advised to think about adding a high/low power switch, or a speech processor switch, in its place.

One feature I like is the SPAN control. With a flick of the push-button, you can change the tuning rate from 10 kHz to 1 kHz–100 Hz. This rate takes effect on the VFO. You can easily OSY up 5 by pushing the SPAN button so that the small line that appears is under the 100 kHz place on the frequency readout. After that it just takes five clicks of the "up" button.

Documentation

The documentation has drastically improved. The manufacturer is actually beginning to understand that our market is different from the general consumer market, and they have included schematics. True, they are small, and in some cases you need a magnifier to trace a line or signal, but it's a start.

Another feature has remained the same but is still welcome: the large, finned heat sink. It looks like it could handle more than 25 watts, but I'm happy with the output. When 10's open, that's all you need.

I'm also pleased with Uniden's realization that the "President" series (the other name for the 2510/2600) was too easily modified by the "freebanders" that operate on 10.5 meters, and by other operators who wanted to operate on 11.5 meters, where the series could also tune. To cope with the problem, Uniden has potted up the areas you need to adjust, and has put warning signs all over the interior. There's also a warning in the manual that makes it clear that Uniden will turn over the name of any person modifying the "President" to operate outside its authorized band. The warning, a large insert in the documentation, easily falls out on the table as you unpack, and it's a color you can't miss.

Two features that have remained the same, which I really don't care for, are the accessory plug and the power jack. Uniden uses a 9-pin Molex™-style connector for such functions as CW, external speaker, and internal speaker.

The method of hookup is about as kludgey as anything I've ever experienced. For example, imagine hooking up your CW key with a Molex-style connector with two wires just sort of drooping into the connector. Aesthetics aside (it looks tacky), it doesn't make sense. Why the manufacturer didn't include miniature jacks for the CW key and external speaker (or phones; it really doesn't matter) is beyond me. There are just too many little pieces of wire hanging off a single, plastic connector. It really isn't convenient to use, especially when you consider that it locks into place and you have to literally pry it apart to change back to the "standard" configuration which features the internal speaker jumpered to work. The power connector seems like a least-cost option, and would be improved by a better, more secure connector.

Still, the last two points are minor, especially if you intend to use the HR-2600 mainly for mobile phone use. In this role it shines brightly. I like it and it has joined my stable of mobile rigs. 73

Marc Stern N1BLH is a frequent contributor to 73 Magazine. *Contact him at 555 Worcester Rd., Framingham MA 01701.*

The Secret of the Accessory Plug

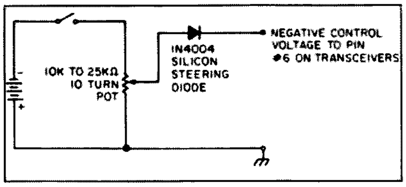
Transceiver to power amplifier—getting the proper drive level.

by Robert E. Bloom W6YUY

Many hams are still plagued with the dilemma of obtaining a proper drive level out of their transceiver to their power amplifier.

Some top-of-the-line transceivers, such as the Kenwood TS-940, provide an adjustable level control for this purpose, but most do not. Units like the Kenwood TS-830, for example, have adjustments for tune-up and CW only. When the mode switch is set for SSB, you have the full 100 watts.

Some hams drop the level, using a high power attenuator between the transceiver and the amplifier, thus dissipating the excessive power in the form of heat. Besides being a very poor solution, it is difficult to locate the necessary noninductive resistors, to say nothing about cost.



Negative voltage applied to Pin 6 controls the transceiver's power output.

The Secret Revealed

So what does one do? You set the drive level with the audio gain control, a poor method at best as you lose all control of mike sensitivity to background noise. The real solution has always been just out of reach because no one has revealed the secret.

The secret lies within the power amplifier accessory plug on the back of your transceiver.

One of the pin connections (#6 for the TS-830) goes to the ALC control circuit. Its purpose is to suppress excessive drive to the amplifier in the form of a negative feedback, an inverse voltage which limits the drive power to the amplifier. It becomes active when the transceiver sees excessive VSWR when looking into the amplifier. Drive power is thus limited to protect the transceiver's output transistors from burnout.

Of course, if you have the manufacturer's mating amplifier, then the proper interfacing circuitry is built in, and you do not have a problem. If you happen to be using an amplifier not made for the transceiver manufacturer, chances are that the ALC circuit is not compatible, and you do not use the ALC pin on the transceiver's accessory plug. And we are back to square one. The secret is divulged by the proper application of a manually controlled level of negative voltage to the ALC Pin #6. This will allow you to set up any power level output you wish from your transceiver.

You will need a bias box. The parts required are a 10k to 25k ohm potentiometer (10-turn variety recommended for ease of level setting), an SPST switch, a connector, a current steering diode, and a 9V battery (need not be "energized" type). The steering diode prevents battery drain in case you forget to turn the switch off.

The circuit in the figure should be self-explanatory. The value of negative voltage applied to Pin 6 controls the transceiver's power output. Of course, the higher the negative voltage, the lower the power level.

You can monitor the output power level with the transceiver multiple purpose meter. If the unit does not have a power level indicator, it would be nice to insert a Bird model 43 or other unit between the transceiver and the amplifier.

Is someone saying, "How come I never saw this before?" ■

Bob Bloom W6YUY can be reached at 8622 Rubio Ave., Sepulveda CA 91343.

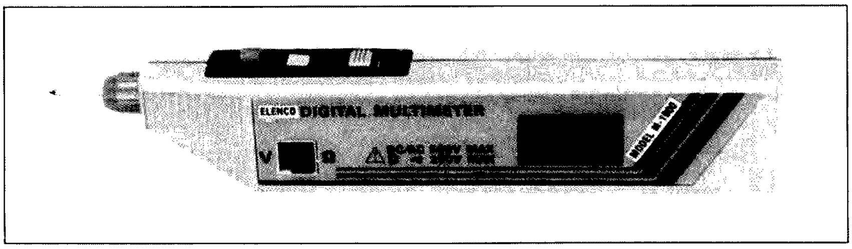
Number 16 on your Feedback card

73 Review by Larry R. Antonuk WB9RRT

Elenco M1900 Digital Multimeter

Elenco Electronics, Inc.
616 South Wheeling Road
Wheeling IL 60090
Tel. (312) 541-3800
Price Class: $45.

Advanced features at a reasonable cost.



Elenco's Digital Multimeter. A handy multitester probe.

It was bound to happen. In this age of high tech watches, LCD speedometers, and pagers-in-a-pen, it was only a matter of time until some of that new technology filtered down to the lowly electronics technician. The most common high tech test tool lately is the digital multimeter probe.

The Elenco Electronics M1900 probe is an excellent example of this new technology. Based on a custom-designed 80-pin LSI chip, the unit packs a variety of features in a hand-held package. The LSI chip means a low over-all parts count, which equals high stability and reliability.

". . . it was only a matter of time until some of that new technology filtered down to the lowly electronics technician."

Advanced Features, Easy Access

Until recently, features such as auto ranging and auto polarity, LCD display with various function annunciators, overrange indicators, and a data-hold function, were found only on high-priced units. The low-priced M1900 has all these.

Using the M1900 gets easier with each reading. The unit fits the hand well, and all the buttons are right where your fingers expect them to be. The OHMS function has an audible alarm for continuity testing. Hard-to-get-at places are a cinch to reach, especially with the three-inch probe tip extension.

Measurement ranges are suitable for most general ham use—200 mV to 500 V DC, 2 V to 500 V AC, and 200 to 20 MΩ.

Minor Drawbacks

The unit will withstand a 700 V peak pulse in either voltage mode, which means you won't be troubleshooting your kilowatt linear power supply. Another minor drawback is the lack of a current measurement mode. While this may be a problem for some hard-core experimenters, most beginners won't find this too much of an obstacle.

The Elenco Electronics M1900 Digital Multimeter provides functions unheard of a few years ago, at a very reasonable cost. Whether as a spare meter in the bottom of the toolbox or an experimenter's primary instrument, the M1900 is a solid test equipment value. 73

Phase III Hamsat Signal Reporting

Do you really know what "S9" means?

by Ed Clegg W3LOY

I have always found fault with the signal strength reports that we hams exchange. On the HF bands we tend to be at the mercy of someone who decided that a 25, 50, or 100 microvolt signal was the correct input to be defined as S9 on his product. Then many of us have suffered under the misconception that each progressive step between S1 and S9 represents a 6 dB increment. It just ain't so.

Element	Best case	Worst case
Transmitter Pwr.	+33 dBm	+33 dBm
Antenna Gain	+6 dBi	−2 dBi
Path Attenuation	−146 dB	−170 dB
Rcvr Antenna Gain	+13 dB	+13 dB
Receiver Input	−94 dBm	−126 dBm

Table 1. Range of beacon signal strengths to be expected at a typical AO-13 Mode B station.

S-meter deflection is normally derived from the receiver's AGC system, and most current HF models delay AGC until signals of 1 microvolt or more occur. Consequently, the S-meter scale between S1 and S9 may encompass a signal range as small as 28 dB instead of the 48 dB span required to satisfy the 6 dB per S-unit criteria. An average of 4.5 dB per unit is typical and none of the ones I have had the opportunity to evaluate maintain linearity below S9. The result is that all S9s are not equal and anything either side of S9 is a myth. Witness the frequent occurrence of: "You're 5 by 9 plus 20 here, OM. Would you please repeat your handle, QTH, and my report." I rest my case!

Now that we have an exciting new mode of communication via Phase III satellites with their own unique characteristics and operating features, shouldn't we re-examine our signal reporting system? I propose that we start now and create some new standards for signal report exchanges in our OSCAR activities, standards that have meaningful quantitative values. Let's look at some of the available options.

Phase III Signal Characteristics

Three significant factors differentiate our Phase III satellite signal characteristics from those we are accustomed to in our terrestrial operation.

1. Whenever we are within the usable footprint of the satellite, we can monitor a continuous signal from its beacon transmitter. This signal not only advises us via telemetry as to the state of the satellite's health and welfare, but it also provides us with a yardstick for evaluating the current propagation conditions existing between itself and our QTH.

2. We will observe that none of the downlink signals ever approach the maximum strength of signals that we typically encounter from HF, VHF, or UHF Earth-based sources (or even the strength of signals from low orbiting birds, for that matter).

3. When we transmit on the appropriate uplink frequency we can receive our own repeated signal as translated by the satellite's transponder and delayed by the finite propagation time of the round-trip distance between our QTH and the bird. (The first time you hear your return signal from space will be at least as memorable as was your very first Earthbound QSO.)

> *". . . as in any communication channel, it is really Signal to Noise Ratio (SNR) that interests the user."*

If we have a station suitably equipped to enjoy Phase III "bird-watching" we will have a low-noise receiving system including a preamplifier and a circularly polarized beam antenna with azimuth and elevation position control.

Let's see if we can't use these signal characteristics and station features to create a meaningful signal level quantifying technique for Phase III (and probably other) satellites.

A Long Journey From the Bird

What are the factors that determine the strength of the satellite's signals at any given receiver's input? How many variables influence it? Let's take a look at the significant elements. To eliminate the uplink variables, suppose we attempt to predict the strength of the beacon signal for possible use as a benchmark.

1. Beacon transmitter power output.
2. Satellite downlink antenna gain.
3. Slant range from satellite to the receiving QTH.
4. Atmospheric, ionospheric, and obstruction losses.
5. Effective gain of the receiving antenna.
6. Attenuation in the feedline.

We should establish minimum and maximum values to see what range of beacon signal strengths will be experienced. Let's do some arithmetic. Let's put some numbers into the six items tabulated above. To simplify matters, let's use OSCAR 13's (AO-13) Mode B General Beacon as an example since here we have an established range of verified variables.

The beacon component of the transmitted power is a nominal 2 Watts. This is a level of 3 dBw. AO-13 switches between two independent Mode B downlink antennas depending on the satellite's orbital distance from Earth or Mean Anomaly. The beam antenna provides a gain of approximately 6 dBic while the omni-antenna has a gain of −2 dBic. ERP is therefore 9 dBw and 1 dBw for the beam and omni cases respectively.

The largest numerical component in our signal budget is the path loss attributable to the distance between the satellite and our Earth location. This is also the most variable component with a range of as much as 24 dB between an apogee at our horizon and a perigee directly overhead. In the latter case, a range of about 2500 km, the free space attenuation will be approximately 146 dB. The other extreme, with a range of about 40,000

km, the path loss increases to approximately 170 dB. Fortunately, some of this variation is offset because the ever-wise planners of our Phase III satellites programmed the selection between the gain and the omni-antennas to minimize this effect. That is, the beam antenna is activated at times when range and path loss are greatest. Ideally, at these times the bird's orientation is such that the beam is directed at earth. Conversely, when height is less than about 5000 km, the antenna gain is reduced by about 8 dB and the pointing angle is poorer (but less critical) because the omni-antenna is activated.[1]

In addition to the free space attenuation, the downlink signal also will experience losses attributable to the vagaries of the ionosphere and the atmosphere. At 146 MHz, these remain fairly constant except during unusual periods and probably rarely exceed 2.5 dB. Let's add 2 dB to our free space loss to account for this.

Items 5 and 6 in our tabulation of transmission variables are those unique to our individual stations. In actuality, they have a less variable range than some of the ones we just examined. That is, nearly all Mode B enthusiasts end up with a circularly polarized beam with between 10 and 16 dBic gain and between 0.5 to 3 dB of feedline loss. Let me hasten to add that these few dB of difference are not to be considered insignificant: The operator with the 16 dB antenna and the 0.5 dB feedline loss will be much more satisfied with his operation than his 9 or 10 dB inferior neighbor. If ya can't hear 'em ya can't work 'em! And frequently that 9 or 10 dB makes the difference. For the purpose at hand let's take a 13 dB gain to represent the net antenna performance including feedline losses, if any.

Let's apply the above values to establish the range of beacon signal strength we might expect at our receiver input.

1. The transmitter output is stated to be 2 Watts or 33 dBm.
2. The antenna gains are 6 dBi and −2 dBi on bearing.
3. Our path loss will be between 146 dB and 170 dB.
4. We will attempt to maintain other transmission losses to about 2 dB.
5. Our ground station receiving antenna will have gain of 13 dBi. (See Table.)

Our received signal will be the algebraic sum of these values. Table 1 displays the individual components and the best/worst case results. As we can see, signal extremes of −94 and −126 dBm are theoretically possible. AO-13's antenna selecting program and other factors can reduce the maximum expected signal by 8 or more dB so we can expect a probable range of beacon signal strengths of −126 to −100 dBm at a typical Phase III, Mode B installation. (In a 50Ω system these represent signal levels between 0.11 and 2.24 microvolts.)

These are certainly not BIG signals when thought of in HF band terms. But, keep in mind that we are listening in a VHF band where noise is substantially lower than on the HF bands. And, as in any communication channel, it is really Signal to Noise Ratio (SNR) that interests the user. So, how do these signals stack up against our noise sources?

We have several types and sources of noise existing in our receiving system:

1. The internally generated noise of our receiving system.
2. Sky and Earth thermal noise within the effective aperture of our receiving antenna.
3. The noise floor of the satellite's receiving system as translated to its downlink.

"... all S9s are not equal."

4. Atmospheric noise in the environs of our system.
5. Manmade noise of local origin.

These five noise contributors won't go away. The only one over which we have much control is our receiver noise.[2] The receiver's noise figure will also be the component that can be expected to remain essentially constant from day to day. And it's also the one that we can observe independently of all others since the others disappear when we disconnect our antenna and replace it with a 50Ω resistor. Perhaps this is our logical choice for S-zero?

In the nearly ideal case we might have a receiver with a noise figure of 1 dB including feedline loss (which directly adds to the NF). For our SSB operations, we are apt to be using about a 2600 Hz receiver bandwidth. These two constants, 1 dB NF and 2600 Hz, represent an equivalent noise power of about −146 dBm referenced to the input of our receiver. Compare this value with the −100 to −126 dBm beacon signal level we calculated earlier. If there were no other noise to contend with we would never have less than a 20 dB SNR condition with a walloping 46 dB SNR at times.

An antenna temperature of between 250° K and 1000° K attributable to sky noise can be expected at 146 MHz for the size antenna we are to be using. As before, Dr. Boltzman has provided us with the tool to convert this temperature into an equivalent noise power of between −140.5 and −136.5 dBm into our receiver. We established earlier that our 1 dB NF receiver with 2600 Hz bandwidth had an equivalent input noise level of about −146 dBm. This indicates that the sky noise will bring our effective noise level up by 5.5 to 9.5 dB above the receiver's own noise level. Noise should still be comfortably below the −126 dBm worse case beacon signal.

The third noise component, the noise output of AO-13's receiving system translated to the downlink frequency, is never of significance in defining our ability to monitor the beacon, but it can become a limiting factor in our ability to copy signals that are very weak at the satellite's input. Under good conditions, this noise level may be a significant part of the increased noise that one observes when the satellite transponder is activated and the ground station antennas are properly oriented. It could be another reference level for comparative signal strength reports.

The other noises we must contend with are essentially unique to the environment of our QTH. Atmospheric noises are not normally of great consequence on 2 meters except during local electrical storms when most of us are reluctant to have our precious GaAsFET amplifier on line anyway. Local man-made noise certainly can be a problem. Its elimination (or reduction to inconsequential levels) requires legwork, political savvy, and technical talents and facilities. I have never found a persistent local noise source that I couldn't finally cure. In some instances it could be questioned whether the same effort extended elsewhere might not have been of more value. Whatever its level may be, it does not represent a factor that should enter into the strength report that we give to our QSO mate. It can, of course, have a significant bearing on the readability report we may give him. But the intent of this article is to deal with evaluating signal strength. We can leave the readability element for a later presentation.

How shall we implement metering for a suitable signal measuring scheme? I have devised several rather simple techniques for performing the task more or less to my satisfaction.

One "keep it simple" approach I have used merely monitors receiver output with a simple audio voltmeter.

First I disable the receiver's AGC, an obvious requirement if my audio output amplitude is to remain a linear function of input signal amplitude. More correctly, I reduce the receiver's RF Gain until the largest expected signal strength does not exceed the receiver's AGC threshold. Most present day receivers cause their S-meters to go up scale as the RF Gain is reduced. With about 18 dB of gain in my GaAsFET preamp and about 14 dB of gain in my 146–28 MHz converter, I find that reducing the RF Gain control on my Kenwood TS-120 until the S-meter is somewhat above S9 results in a condition that no signals ever activate the AGC, as evidenced by further increases in the S-meter reading.

I had a small packaged LM-380 audio amplifier available with a gain control at its input and an 11:1 voltage step-up transformer (Radio Shack #273-1380) driving a Triplett 630 VOM across its output. With the VOM in the AC volts mode and the input connected across the receiver's output, I have a simple, convenient to calibrate, relative dB meter.

I set the receiver's AF gain at a comfortable listening level on the beacon or any typical signal. Since I have currently elected to use my receiver's noise floor as my basic (S-zero) reference level, I replace the antenna into my converter with a 50Ω resistor. I then adjust the gain control on the LM-380 input so that I have a −10 dB reading on the most sensitive range of the VOM. A virtue of the Triplett 630 for this function is that there is a 10 dB scale change when going from the most sensitive to the next most sensitive range. This, combined with a 21 dB scale range

above the −10 dB reference provides me with an active 31 dB readily usable metering range. This is more than adequate to cover the range of signals I experience during an AO-13 orbit.

Using this configuration of hardware I am able to evaluate my signal and all others received against any one of the several references. That is, I have direct reading in decibels of any signal over the noise inherent in my receiver. By observation and simple arithmetic I am able to establish the relative strength of the composite received noise from all sources and to some extent determine the noise floor of the satellite's transverted receiver by positioning my antennas at and away from the bird.

The most useful function, of course, is the ability to make realistic measurements of received signals in terms of decibels above a repeatable standard.

I find the ballistics of the Triplett meter and several others that I have tried (including an old reliable Simpson 260) to be quite satisfactory. I occasionally connect a 'scope across the audio signal when the nature of the signal indicates an unusual peak-to-average ratio. I have also done some work with rectifying the audio output giving the opportunity to arrive at different integrating time constants. Some further work in this direction will be done in the future.

A more sophisticated version of the above configuration has recently been breadboarded. It differs principally in taking a fixed level of audio from the receiver and, by using two separate LM-380 packaged amplifiers, having completely independent control of listening and metering channels. (A commercial version of this implementation is being considered by one of the established ham manufacturers.)

I have installed a SPDT coaxial relay in my receiving antenna system. Its function is to permit me to instantaneously switch from the antenna to a 50Ω resistive input to verify calibration. Its second function is to let me sleep better during electrical storms since the relay reverts to the resistive input mode when I power down the station. This, hopefully, will give my GaAsFET preamplifier a fighting chance to make it through the coming summer.

All of the above was not intended to define what any one of the readers might want to do in the way of configuring their station. However, I hope this article might stir up some thinking on the part of OSCAR users regarding establishing a meaningful signal strength reporting standard. I would certainly appreciate hearing opinions from all who agree or disagree with my philosophy.

In the meantime, I'll be seeing you on AO-13. I'll give you a report in decibels above a reference when we next QSO!

References

1. *QST*, Nov. '88, p. 72. See Table 1 and text.
2. Increasing the size of the antenna may reduce the Earth thermal noise component but not significantly except in the case of a very large array.

Number 18 on your Feedback card

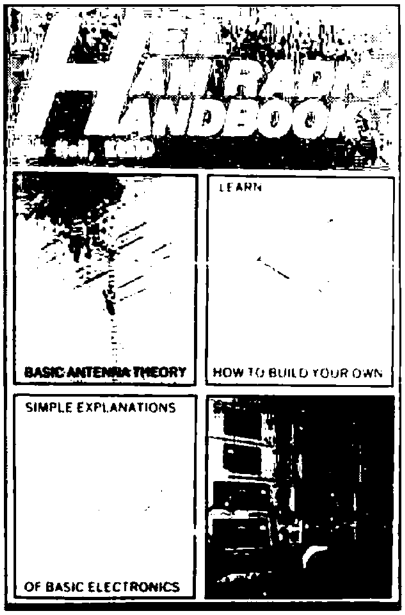
73 Book Review

by Steven K. Roberts N4RVE

Heil Ham Radio Handbook

A rich source of clever ideas.

Heil Ham Radio Handbook
by Bob Heil K9EID
Melco Publishing
PO Box 26
Marissa IL 62257
Price, $10 plus $1 S/H



A commonly lamented trend among hams these days is the tendency toward appliance operation and a poor understanding of the underlying technology. I've heard people arguing over the air about what time it is in UTC, asking how to read resistor color codes, and wondering why an antenna doesn't seem to work even though the SWR is low.

But there are, and always will be, a hard-core cadre of technoid, creative, tinkering hams—those whose shacks are overflowing with home-brew projects, who wouldn't even consider buying a dipole antenna kit, and whose fingers know the burn of a hot soldering iron at midnight when success is so close that thoughts of bed are absurd.

New Ideas

K9EID is one of these. You may know Bob as the brains behind Heil Sound, a source of excellent audio gear for hams and professional recording artists, 10 meter FM conversion kits, and various other devices.

Bob's book, *Heil Ham Radio Handbook*, is not quite what its name implies. It's not a carefully organized reference book like the annual ARRL tome. But it's one of the richest resources of clever ideas I've seen in a long time, 165 loosely organized pages that cover subjects ranging from rampant liddism to remote base design. The chapters on antennas are especially useful, presenting all sorts of interesting variations that never quite make it into the mainstream reference books.

Easy Reading

Throughout, Heil espouses one of the basic tenets of amateur radio: roll your own! He shows how simple it is to throw together logic probes, tuners, yagis, filters, chassis, and so on, topping it all off with a chapter of 37 quickie circuit designs that apply to various aspects of hamming.

The book's informal, practical approach is anything but polished. Indeed, it's rife with misspellings and other editorial glitches, but somehow that makes you want to put on some old clothes and go build something. This is one of those books that will end up looking creased and dirty, its pages folded and scribbled from marathon project sessions. As it should be.

Nothing Else Quite Like It

There's no pleasure in ham radio quite like building something from scratch and putting it to use. The *Heil Ham Radio Handbook* is a good demystifying beginner's guide as well as a handy reference to design ideas that workbench veterans may never have considered.

Either way, it's a worthwhile addition to your shack library . . . especially if you like fast, uncluttered answers to your electronic questions. 73

Number 36 on your Feedback card

The Dual-Band "J" Antenna

A superior performance mobile or base station antenna for 146 and 220 MHz.

by Robert E. Bloom W6YUY

We have several excellent dual-band transceivers. We need good dual-band antennas to complement them. The dual-band "J" described here is a natural for mobile operation, or for base station communications as well.

I designed this antenna to conserve space on the roof of the Los Angeles ARES communication command center mobile van, which is presently being developed with the cooperation of both the Los Angeles City Fire and Police Departments.

Background on the "J" Antenna

Why the "J" antenna? Because it is one of the most suitable for nondirectional communications. To this we can add: superior low angle of radiation, increased gain over a dipole or ground plane, larger signal capture area, and possibly the only design with an inherent full current circulating system. The dual "J" antenna design covers the two most widely used mobile frequencies: the 144 and 220 MHz (2 meter and 1⅓ meter) bands.

The basic "J" antenna, a design which dates back to the mid-1930s, retains characteristics that some present-day antennas are still reaching for: a takeoff of the Zep or Zeppelin of that same period. Its quarter-wave matching section provides the intrinsic feedline current return circuit. The return circuit can be compared to the radials of the ground plane and even more closely to the ladder feed of the Zep. Only the Zep feedline design left the drawing board prematurely.

The ground plane antenna is often installed as though the ground radials are not really important. The length and the number of ground radials not only make up the return circuit but also determine the 37-ohm feedline impedance of the device. Fortunately, many metal automobile rooftops are large enough to accommodate the higher frequencies' units. My thoughts on gutter-mount types of commercial antennas can be expressed as: "Shame on the manufacturer of the device." And, pray tell, where is the current return circuit of the quarter-wave dipole design?

The "J" antenna has an inherent low angle of radiation, unrestricted by the influence of the return circuit of ground or the ground radials. This low angle of radiation produces an extended ground-wave range. In addition, with proper atmospheric conditions, it will allow extended long-range DX communications by allowing the signal to arrive at the ionization layer at an angle that will reflect the signal back to Earth rather than being captured and absorbed by the layer. The ¾ wavelength of the "J" provides a signal capture area three times that of the ground plane and increases its gain by about 1.2 dB. That's almost 3 dB over the so-called reference dipole.

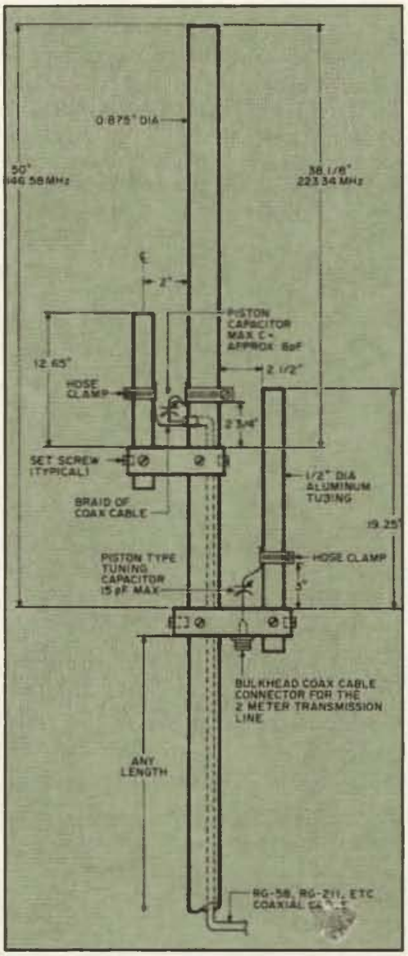


Figure 1. The dual-band "J" antenna.

The Specs

See Figure 1. The radiating sections of the antenna are ¾ wavelength long. The large diameter tubing causes a significant (K) constant factor as related to the wavelength-to-diameter ratio, thus reducing the dimensions a bit. The most significant length reduction is caused by the loading effect of the top antenna acting upon the lower frequency unit. The additions of both C & L are determined by the material's bulk dimensions. The basic formulas remain the same but variations in material sizes make determining "K" somewhat involved. I will work around this in the tuning procedure.

The coaxial feedline for the 220 MHz antenna section is fed up through the inside of a ⅞" diameter main tubing section. An approximately ⅜" diameter hole is drilled into the tubing where the coax exits to connect to the feed point of its matching section.

The lower frequency 2 meter cable is run externally. Any tubing extending below the 2 meter section is not a part of the radiating section but becomes the mast post. This can be of any convenient length consistent with your height and mounting requirements.

The quarter-wave matching sections are of ½" aluminum tubing. These lengths can be determined by a conventional formula, with the applied shortening "K" constant of wavelength to diameter ratio. This article will furnish all dimensions for the basic output frequencies of 146.58 MHz and 223.34 MHz, which are the dominant frequencies used in our ARES communication van. For any selection of frequencies which differ from these, apply the simple formula:

$$\text{New length dimensions} = \frac{\text{Original dimensions} \times \text{Original frequency}}{\text{New frequency}}$$

The change in length will be quite small.

The bar stock used to support the quarter-wave sections is approximately 1½" wide x ¾" thick. This can be almost anything you choose, consistent with rigidity. The holes in the flat portion for mounting the elements and bulkhead coax connector were drilled using ⅞" and ½" end mills or spot face tools. I used 6/32" screws as set screws to hold the elements in place and allow for adjustment. I recommend either two or three screws, whatever is convenient for each slide element. The 8 pF and 15 pF capacity values for the 220 MHz and 146 MHz frequencies respectively are maximum values and will require adjusting for minimum standing wave ratio.

Although a unity SWR can be achieved, it is not an absolute. For mobile operation the transmission line length will have a very low attenuation and virtually all the signal will be radiated. *Continued on p. 84*

Number 21 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the June issue, we should receive it by March 31. Provide a clear, concise summary of the essential details about your Special Event.

MARCH 3, 1990

CAVE CITY KY The 14th annual Glasgow Swapfest will be held at the Cave City Convention Center, by the Mammoth Cave ARC. Doors open at 8 AM Central time and continues until everyone goes home. Admission is $4. Tables $4. New Dealers are invited. HAM flea market. VE exams. Talk-in on 146.34/.94. Contact *N4HCO, 1379 Whites Chapel Road, Glasgow KY 42141*

MARCH 3-4, 1990

BROWNSVILLE TX Starfest International '90 will be held at the Jacob Brown Auditorium. An air conditioned, indoor flea market is provided, as well forums and an escorted shopping trip to Mexico for the ladies. Talk-in 147.39/.99 (English), 146.10/.70 (Spanish). Contact *James C. Parrott K5EHY, Starfest International '90, 2210 S. 77 Sunshine, Harlingen TX 78550*.

MARCH 3, 1990

NORTHAMPTON MA Amateur Radio and electronics fleamarket sponsored by the Mt Tom ARA will be held at the Smith Vocational High School. Handicap accessible. Doors open at 9 AM. Talk-in on 146.94, 223.82 rptrs, and 146.52 simplex. Tables $10 advance, $12 at door. Admission $2, under 12 free. Contact *N1CDR Marvin Yale, 6 Laurel Terrace, Westfield MA 01085, or call (413) 562-1027*

YORK PA The Third Annual York Springfest (Ham & Computer) will be held at the Dover Firehall. Two floors indoor tables. Free tailgating. Inside tables $10. Registration $4. Unlicensed spouse and under 12 free. VEC exams. General admission 8 AM. Talk-in on 146.37/.97 and 147.93/.33. Call *(301) 239-3878 or write: York Springfest, P.O. Box 316, New Freedom PA 17349-0316*.

ROSTRAVER TOWNSHIP PA The Two Rivers ARC of McKeesport is hosting its 18th annual Swap and Shop at the Rostraver Volunteer Fire Hall from 8 AM-3 PM. Admission is $1. Contact *Mr. Jim Lundberg KC3HJ, (412) 672-0915*. Directions will be available on the WA3PBD repeater, 146.13/.73.

MARCH 10, 1990

ABSECON NJ The Shore Points ARC will hold its 8th annual Springfest at the Holy Spirit High School beginning at 9 AM. Set-up 7 AM. Reserve heated indoor selling space. Electricity limited. Outdoor tailgating space available the day of the hamfest, weather permitting. Sellers $5 per space; buyers $3. Talk-in on 146.385/.985 and 146.52 simplex. Write to *SPARC, PO Box 142, Absecon NJ 08201*.

MARCH 11, 1990

INDIANAPOLIS IN The Indiana Hamfest, sponsored by the Morgan County Repeater Assoc., will be held indoors at the Indiana State Fairgrounds Pavilion Building. Open at 8 AM. Admission: $6 at door. 8 ft. table $10 each. No space without a table. Reserve before Feb. 23rd. Setup is March 10. Free parking. VEC exams. Talk-in on 145.25. For reservations and information send SASE to *Aileen Scales KC9YA, 3142 Market Place, Bloomington IN 47403. (812) 339-4446*

STERLING ROCK FALLS IL The Sterling-Rock Falls ARS 30th Annual Hamfest will be held at the Sterling High School Fieldhouse from 7:30 AM. Set up Saturday from 6-9 PM. Tickets $3 advance, $4 at the door. Tables $5, including electricity. Bring your own cord. Talk-in on 146.25/146.85 W9MEP repeater. Contact *Sue Peters, Sterling-Rock Falls ARS, PO Box 521, Sterling IL 61081 or call (815) 625-9262*

CIRCLEVILLE OH Teays ARC is having a hamfest at Pickaway Co Fairgrounds. Doors open 8 AM-4 PM. Admission $3 advance, $4 at door. Tables $5 advance, $6 at door. Handicap accessible. Free parking. Talk-in: 147.78/.18. Contact *Larry Martin N8EPY, 126 Pleasant St., Circleville OH 43113 (614) 474-6582*. Please SASE.

MARCH 17, 1990

ALEXANDRIA VA The Fairfax Computer Fair-90 is being sponsored by the Thomas Jefferson High School for Science and Technology PTSA in conjunction with the Capital PC User Group, at the Thomas Jefferson High School from 9 AM-5PM. Call *Mark Bakke, Capitol PC User Group, (301) 530-1303, or Morton Rau, Thomas Jefferson PTSA, (703) 754-9859*.

MARSHALL MI The Southern Michigan ARS and Marshall High Photo Electronics Club are sponsoring their 29th annual Michigan Crossroads Hamfest at the Marshall High School from 8 AM-3 PM. Set-up at 6 AM. Advance tickets (SASE) $2, $3 at the door. Table reservations $.75 per ft. (min. 4 ft.). Reserved until 8 AM. Table rental is not a ticket to the hamfest. Talk-in on 146.66 or 146.52. Send SASE to *SMARS, PO Box 934, Battle Creek MI 49016 or call Wes Chaney N8BDM (616) 979-3433*.

MARCH 17-18, 1990

CHARLOTTE NC The Mecklenburg ARS is sponsoring the Charlotte Hamfest and Computerfair at the Charlotte Convention Center Saturday from 9-5 and Sunday from 9-2. All major manufacturers and dealers will be there. VEC exams. Tickets are $5 in advance, $7 at the door. Swapfest tables are $12 in advance only. Children under 12 free. Talk-in on W4BFB/r on 146.34/146.94. Write to *Charlotte Hamfest, PO Box 221136, Charlotte NC 28222-1136 or call (704) 536-7373 for ticket and table info. (704) 568-7611 for dealer and manufacturer info.*

FT WALTON BEACH FL The Playground ARC will hold the 20th Annual North Florida Ham/Swapfest at the Shrine Fairgrounds. Doors open at 8 AM both days. Free Parking. Unlimited RV parking with 30 spaces with full hookups, $10 a day. Talk-in on the club 146.19/.79 repeater. Admission $3 in advance, $4 at the door. Tables are $10 for one day, $15 for both days. Contact *Playground ARC, PO Box 873, Ft. Walton Beach FL 32549*.

HAMILTON BERMUDA The 32nd annual Bermuda Amateur Radio Contest will be sponsored by the Radio Society of Bermuda. The multipliers are VP9 stations which may now be worked on both CW and phone providing they are more than 1 hour apart. Bermuda Novices are restricted to CW on 3.5, 7, 21 and 28 MHz. Each Novice is worth a multiplier of 2. For rules send 2 IRC's to *Bermuda Contest, Radio Society of Bermuda, PO Box HM 275, Hamilton Bermuda HM AX. For answers to specific questions call Steve Dunkerley VP9IM, (809) 292-0754 on which there is both an answering machine and a FAX machine. FAX activated by pressing 5 and then * (star) after the call is answered*

MIDLAND TX The Midland ARC will hold its annual St. Patricks Day Swapfest from 10 AM-5 PM Saturday, and from 8 AM-2:30 PM Sunday at the Midland County Exhibit Building. Pre-registration is $5, $6 at the door. Tables are $6. Contact *Midland ARC, PO Box 4401, Midland TX 79704*.

MARCH 18, 1990

MAUMEE OH The Toledo Mobile Radio Association Hamfest will be at the Lucas County Recreation Center from 8 AM-5 PM. Advance admission $3.50, door $4. Talk-in: 147.27 rptr, 442.85 rptr. Contact *Ron Morris WB8ZIM, 28141 Glenwood Rd., Perrysburg OH 43551 (419) 666-8063*

WEST HARTFORD CT The Insurance City Repeater Club Inc will hold its annual Computer and Amateur Radio Flea Market at the American School for the Deaf. Doors open 9 AM-2 PM. Admission $2. Tables $15. Usually sold out so please register early. Talk-in: 146.28/.88. Contact *Chuck Motes K1DFS, 22 Woodside Lane, Plainville CT 06062*.

MARCH 24, 1990

ELIZABETHTOWN KY The Lincoln Trail ARC will hold its 11th annual Hamfest at the Pritchard Community Center. Free parking. Admissions $4 advance, $5 at the door. Vendor spaces $5 each (includes 1 table, 1 chair.) VEC exams. Talk-in on 146.52 and 146.38/.98. For advance reservations/tickets send check or MO and an SASE to *Chuck Strain AA4ZD, PO Box 342, Vine Grove KY 40175 (502) 351-1715*.

UPPER SADDLE RIVER NJ The Chestnut Ridge RC is sponsoring a Ham Radio Flea Market at the Education Bldg. of the Saddle River Reformed Church. Tables are $10 for the first, $5 for each additional. Tailgating $5. $1 donation. Contact *Jack Meagher W2EHD (201) 768-8360*.

MARCH 25, 1990

MADISON OH The Twelfth annual Lake County Hamfest will be held at the Madison High School by the Lake County ARA. Open from 8 AM-3 PM. All indoors. 6 ft. tables are $5, 8 ft. tables are $8.50. VE exams. Admission $4 at door, $3 in advance. Talk-in on 147.21/.81, 222.90/224.50. Contact *LCARA Hamfest, 5777 Fenwood Ct., Mentor-on-Lake OH 44060. (216) 257-2036*.

GRAYSLAKE IL The Libertyville and Mundelean ARS (LAMARS) will be holding its annual LAMARSFEST 1990 at the Lake County Fairgrounds from 8 AM. Set-up from 6 AM. Indoor electronic and radio swapfest, commercial exhibitors. Free parking. Admission is $3 advance, $4 at the door. Swapfest tables $7, commercial tables $20 by reservation only. Talk-in on 147.63/.03 Waukegan rptr and 146.52 simplex. Write with SASE to *LAMARS, PO Box 751, Libertyville IL 60048, or call Bob Dick NY9E (708) 362-9634 after 7 PM*.

TRENTON NJ The Delaware Valley Radio Association will sponsor Hamcomp '90, their 18th annual Flea Market of amateur radio and computer equipment, at the New Jersey National Guard 112th Field Artillery Armory, from 8 AM-2 PM. Doors open at 6 PM for vendors. Free and handicap parking. Wheelchair accessible. Talk-in on 146.07/.67. Contact *HAMCOMP '90, c/o KB2ZY, R.D. 1, Box 259, Stockton NJ 08559* (SASE please.) Admission is $3 in advance, $4 at the door. Indoor selling spaces are $10 (wall space) or $7, outdoor spaces are $6. Sellers provide their own tables.

BRAINTREE MA The South Shore ARC of Braintree MA will hold its annual indoor flea market at the Viking Club from 11 AM-4 PM. Admission $1. Set-up at 9 AM. 8 ft tables available for $10 (includes 1 free admission per table) only if paid in advance before March 23 by sending payment to *Hal Jones WB1ABM, 48 Saning Rd., N. Weymouth MA 02191*. Tables cost $12 at door. Make checks payable to South Shore Amateur Radio Club. Free parking. Rain or shine. Call *Hal, (617) 335-5777 evenings*.

SPECIAL EVENT STATIONS

MARCH 2-4, 1990

GRAND ISLAND NE The Grand Island ARC will operate ARS WOCUO to celebrate the annual return of the Sand Hills Crane to the Platte River Refuge, from 0000Z Mar 2-2400Z Mar 4. Operation will be SSB, CW, PKT, AMTOR, and RTTY in all lower portions of General and Novice bands. For certificate, send QSL, #, and SASE to *ARS WOCUO, PO Box 642, Grand Island NE 68802*

MARCH 10-11, 1990

MILWAUKEE WI The West Allis RAC is operating a Wisconsin QSO Party from 1800Z March 10-0100Z March 11. CW and phone. All stations may be worked once per mode on each band. Mobiles may be worked once per mode per county that they operate from. No repeaters. Frequencies: CW: 3550, 3725, 7050, 7125, 14050, 21150. Phone: 3890, 7290, 14290, 28400. Contact *Wisconsin QSO Party, West Allis RAC, PO Box 1072, Milwaukee WI 53201* for contest rules and entry form.

CHARLESTON WV KE8OJ will operate a special events station to commemorate the 75th birthday of the United States Naval Reserve. Hours will be 0800-1600 both days. Frequencies: 3.875, 7.250, 14.250, and Novice portion of 10 meters. For a certificate send OSL and SASE to *Eric Knapp KE8OJ, 917 Glen Way, So. Charleston WV 25309*.

MARCH 17-18, 1990

PISCATAWAY NJ The Piscataway ARC will operate their annual special event commemorating the Voice of America Relay station, WBOU, which operated during WW II in the Bound Brook section of Piscataway. Members of PARC will operate under their own callsigns signing /VOA from 0000Z March 17-2400Z March 18. Frequencies: CW: Novice portions of the bands. Phone: Lower third of the General portion on 75, 40, 20, 15 meters and the Novice portion of the 10 meter band. For certificate send #10 or for unfolded a 9x12 SASE with your QSL to *PARC, Attn: KB2UV, PO Box 1233, Piscataway NJ 08854*.

MARCH 20-21, 27-28, 1990

AC-DC/CLARA CONTEST All licensed men and women throughout the world are invited to participate. CW portion 1700Z March 20-0500Z March 28. Phone portion 1700Z March 27-0500Z March 28. Frequencies: Phone-28.488, 21.300, 14.120, 7.070. CW:-21.035, 14.035, 7.035, 3.690. Send logs to *Net Manager, Jeanne Gordon VE2JZ, 5 Wood Crescent, Beaconsfield, Quebec H9W 1C5 Canada or Certificate Custodian, Diane Ernst, R.R. #1, Maplehill Dr., Big Bras D'or, Nova Scotia B0C 1B0 Canada*.

MARCH 21-24, 1990

CLEVELAND OH Members of Westpark Radiops will celebrate Novice enhancement from 0001 UTC March 21 until 2400 UTC March 24. Frequencies: 28.300-28.500 USB. For certificate work 5 Westpark members. Send OSL, log and 9x12 SASE to *W8VM c/o Glenn Williams, 513 Kenilworth Rd., Bay Village OH 44140*. Other awards available. Send SASE for list and rules.

Number 22 on your Feedback card

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS. (120 baud, 8 data bits, no parity, 1 stop bit, (603) 525-4438). Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters l or i, or even the number 7. Thank you for your cooperation.

I own a Royce rig, Model 639 and I was wondering if it would have the same schematic as the 655. My rig is out of commission, and I don't have a schematic for troubleshooting. Can you help me get a copy of the schematic and parts list? I'd be more than willing to compensate you. *Eugene G. Twano, E Division, USS Ranger CV-EO, FPO San Francisco CA 96633-2750.*

Wanted: Operating manual for the Kenwood TR-2600A. Will pay costs. *Frank Miraglia KB2IFO, 831 Bartholdi St., Bronx NY 10467*

Wanted: Schematic/operator's manual for Lafayette HA-460. Will pay costs. *Stephen Brzoska, 27 Willow St., Washington NJ 07882*

I'm looking for a Programmer's Tool Kit for Hewlett-Packard HP-110 Portable (or Portable Plus), such as the one HP calls "HP 45419C." Also any software for this vintage laptop, preferably amateur radio applications. *Chuck Waite WA3JWF, PO Box 555, Dallas PA 18612-0555*

Number 23 on your Feedback card

HOMING IN

Radio Direction Finding

Joe Moell PE KØOV
PO Box 2508
Fullerton CA 92633

HF Jamming

How do you react when interference spoils your net or QSO on the DX bands? Do you turn on your Band Basher 2000 linear amplifier and give the bloke a piece of your mind? Do you have your autodialer programmed with the phone numbers of all the FCC monitoring stations?

Do any of these reactions do any good?

Of course, interference takes many forms. Inadvertent interference caused by operator error or sudden changes in propagation usually end quickly and amicably. But what about continued disruptive jamming with carriers, music, or obscenities? That's malicious interference, a clear violation of the FCC rules. It's unpleasant at any time, but when it occurs during emergency nets, it tarnishes our public image and could cost lives.

The first thing most hams do when jamming occurs is cry out for FCC help. That worked forty years ago. We called it the Kilocycle Kop era. Back then, FCC monitoring stations patiently scanned the spectrum, looking for rule violations in all services, including amateur radio, and issuing those dreaded "pink tickets."

No More Kilocycle Kops

Not so today. Budget cuts have decimated the FCC field staff. Those remaining must deal first with interference problems in higher priority radio services, such as White House communications, search and rescue, fire and police. Field engineers must conduct inspections in the broadcast and maritime services before they can consider the needs of hams. It seems as if every service has a higher enforcement priority than amateur radio.

Hams constantly castigate the FCC for its apparent paralysis, but the current FCC budget simply does not allow any more attention to our bands. Who cut the budget? Congress, of course. So don't bellyache about the FCC, write to your congressman. I'll bet he will tell you that there haven't been any letters coming to his office lately demanding a larger FCC appropriation for monitoring and enforcing ham radio.

Is the average taxpayer (your next door neighbor, for example) willing to shell out more to Uncle Sam so the FCC can fight amateur radio QRM?

If you asked any of them (FCC, congressman, neighbor), they would probably say, "Why can't you hams solve your own problems? You're supposed to be self-policing!"

It's Up To Us

So the ball is right back in our own court. Instead of endless wailing, we need to get busy and start dealing with our interference problems, not by on-the-air fistfights, but with radio direction finding (RDF). The FCC has agreed to help us help ourselves by creating the Amateur Auxiliary, an organization of volunteer monitors, administered by the ARRL.

Trained Auxiliary members can use RDF to gather evidence the FCC can use in prosecuting severe cases of malicious interference. More importantly, this organization has the capability of solving many interference problems ham-to-ham, without FCC intervention, for faster resolution. Limited FCC resources can be saved for only the most severe cases.

The Amateur Auxiliary is in varying stages of implementation around the country. In some places, it already has standing agreements with FCC offices. Contact your ARRL Section Manager to find out the status in your area, and learn how you can help. Don't just complain, get involved!

Inanimate Interference

One important step in moving from being part of the problem to being part of the solution is developing your own transmitter hunting capability. That's what this column is all about—helping you with the nuts and bolts of RDF. You will find RDF techniques useful whether you want to find the location of a jammer or a noisy power line.

Hunting down malicious QRM on the HF bands is not the same as going out on a competitive foxhunt on the local 2 meter repeater. Your technique must be much more methodical. Time is of the essence, but you must be absolutely sure of your equipment and its indications. You must take notes and gather evidence good enough to stand up to close FCC scrutiny.

Beams Aren't Enough

Put away any ideas of doing pinpoint DFing from fixed stations with typical DX-band antenna systems. Even military installations with giant RDF arrays can have significant inaccuracy. If the QRM is coming in via long skip, there is no guarantee that it's coming from the direction of your best beam heading.

Propagation anomalies regularly cause signals to deviate from the shortest great circle path. The best you can hope for in long distance RDF is to get bearings from enough widely separated stations to be able to triangulate down to an area of reasonable size. Then you must get stations in that area to listen for the signal via ground wave.

Don't even think about trying to use simple antennas for RDF, even on ground wave signals. A Butterfly quad-bander at 30 feet is simply not directional enough for even a good guess. Even the best DX antenna systems are none too good. A large tri-band beam, such as the TH-7, has a horizontal 3 dB beamwidth of ± 35 degrees, and you won't get that unless it's a wavelength or more up in the air.

In simple terms, that means that as you turn your beam, the signal will be within a half S-unit of peak value for 70 degrees of rotation as you sweep around. Can you read the S-meter on an SSB signal well enough to discern the exact peak under these conditions? Remember the jammer may not be the only signal that is showing on the meter.

Add to this the fact that big rotators take a minute or so to turn all the way around. Their readout accuracy is far from perfect. So it's almost impossible to find the precise signal peak direction on short duration signals using a typical ham yagi or quad, especially if fading and other signals are present.

It's a good assumption that typical real-world RDF accuracy using tower-mounted beams, ham receivers, and careful technique is ± 20 degrees. Let's further presume that we have three such stations, equally spaced 40 miles apart, attempting to triangulate a ground wave signal source somewhere inside the triangle formed by the three station locations. The ± 20 accuracy figure means that the triangulation will yield an area of uncertainty nearly 250 square miles in size.

If you are serious about fixed-site HF RDF, you must build an antenna with sharp directional indications, and put it on a rapidly rotating mount. An Adcock is the antenna of choice, because it has sharp nulls and works equally well with ground wave and high angle skip signals.

But you will still have a few degrees of error. If the target is 60 miles away, each degree of error causes the line of bearing to miss the target by one mile.

You Gotta Go Mobile

Unless one of the members lives next door to the jammer, a team consisting of fixed stations cannot positively identify him. Eventually, someone is going to have to go mobile to track down the bad guy's exact location and document the case. The more mobiles there are in the field, the sooner it will happen.

For quick response to HF jamming problems, we need fixed stations first to find the general area of the problem source. If they can narrow the search area down to a limited area, mobiles will have little trouble closing in and finishing the job.

Mobiles don't need pinpoint accuracy in their RDF indications, because they simply "home in" on the signal, following the line of bearing to the target. Minor system or site errors are no problem as long as you keep moving along. If you have your HF transceiver in the family car, you are already halfway to the goal of becoming a mobile HF T-hunter. All you need is an antenna and an RF attenuator.

Fortunately, on the HF bands a simple RDF loop is very effective for closing in. Next month I'll show you all the details of how to make one in an evening or two with just a few simple parts. This multiband antenna has two selectable patterns to solve the typical loop bidirectionality problem. It is light, sturdy, and easy to mount. You can use it either on the car or on foot.

If hams across the country added simple antennas like this one to their mobile setups, imagine the progress we could make in identifying and deterring malicious QRM on the DX bands. Will you help? 73

Dx

Hams Around the World

Bob Winn W5KNE
c/o QRZ DX
PO Box 832205
Richardson, TX 75083

QSLing: Facts, Tips, Fantasy . . .

Traditionally, the QSL has been considered the final courtesy of a QSO, but is this grand statement still true today? Yes, in most situations it is, BUT it is now accepted procedure to help a DX station, QSL manager or DXpedition by paying the return postage when QSLing direct. If you don't provide a self-addressed-envelope (SAE) plus some means of paying for return postage, expect to receive your card via the bureau . . . if there is one.

The manner in which you prepay the return postage is really up to you, but it's acceptable, within reason, for the DX operator to suggest that you send IRCs or a green stamp (one US dollar). Remember, some countries do not accept IRCs and there are countries where foreign currency is illegal. It is acceptable for a DX operator or DXpedition to solicit contributions, but a contribution can never be a requirement.

Possibly the most important item to consider is the correct QSL route for the rare station that you have just worked. The best source is the station itself. Other excellent sources of accurate QSL information include DX bulletins, such as *QRZ DX, INSIDE DX, THE DX BULLETIN,* and DX nets. The three publications specializing in QSLing information, which I'm most familiar, are *THE W6GO/K6HHD QSL MANAGER LIST*, PO Box 700, Rio Linda CA 95673-0700; the *DXER'S QSL MANAGER DIRECTORY*, Fred Smith WB4KCL, 27 Princess Gillian Street, Fredericksburg VA 22405; and *THE MOST COMPLETE QSL MANAGERS LIST EVER PRINTED*, Lars E. Bohm SM5CAK, Stora Angesby, S-59196 Motala, Sweden.

Care and Feeding of QSL Managers

What is the correct way to handle a direct QSL? There is no absolutely correct way, because each QSL manager or DX operator has his or her own way of handling incoming cards. Some managers prefer one QSL per envelope, while others, like those who have computerized their logs, often prefer everything in one envelope to reduce handling time. You can ensure near-perfect response to your QSL requests if you follow all or most of the following QSLing rules.

QSLing

DATE AND TIME. *Always note the time in UTC. Never use local time.* Use a readable date, such as Feb. 12, 1989 or 12 Feb. 89. Do not use a date like 2-12-89 for a February 12 QSO, because in some countries the day is listed first, rather than the month. In this example the QSL manager may think your QSO was on December 2, 1989. Also, be sure to use a UTC date, not the local date.

QSL CARD. Your QSL card should have the log information and YOUR CALLSIGN on the same side. This format provides the QSL manager with everything required to fill out your card, accurately and quickly.

ENVELOPES. When QSLing direct, always enclose a self-addressed envelope (SAE) plus some means of prepaying the postage, or a self-addressed-stamped envelope (SASE), otherwise your card will be returned via the bureau. Always use an envelope sufficiently large to contain the DX QSL card. If you don't, the QSL manager will have to fold his card to fit in the furnished envelope. The standard letter-sized envelope used in the US (3⅝" x 6½") may not be large enough, but a business-sized envelope (#10) is usually appropriate.

Many DXers use European- or Japanese-sized envelopes, which are large enough to handle larger QSL cards. It is possible to obtain these envelopes in two sizes, one slightly larger than the other, so that it is not necessary to fold the enclosed envelope. European QSL-sized envelopes (11cm x 16cm) are available from DX QSL Associates, 434 Blair Road, Vienna VA 22180.

ENCLOSURES should be arranged in such a way that they are easily accessible by the QSL manager. IRCs or green stamps should be hidden from prying eyes, but not from the manager. It is probably wise not to put the green stamp or IRCs inside the enclosed envelope where they might be overlooked. Just be sure they're not visible if the envelope is held up to a light.

Some DXers put a piece of carbon paper inside the envelope to hide the contents. If the enclosed SAE envelope is folded, insert it into the outside envelope with the fold at the bottom to prevent it from being cut in half by a letter opener. When sending QSLs to humid locations, it's often advisable to place a piece of waxed paper between the gummed flap and the body of the envelope.

DON'T DELAY. DX operators and QSL managers often change addresses, and over a long period of time logs can be lost. QSL as soon as possible.

YOUR OWN QSL BUREAU. Be sure that you have envelopes at your own QSL bureau.

Good luck and may your QSL return rate be 100%! 73

Now *HERE* is a Flea Market!

Huntsville '89

Number 20 on your Feedback card

PACKET TALK

Latest in Digital Hamming

Brian Lloyd WB6RQN
124 Churchill Avenue
Palo Alto CA 94301

Eat 'n Build

I have moved from the Washington, DC, area to Silicon Valley. Wow, is it ever a big change! This place is computer-hacker heaven. There is even a chain of grocery stores, called "Fry's," that caters to the computer hacker. You can buy your groceries AND all the parts you need to build your computer at the same store. Only in California (hi, hi).

Doing 800 Hz Shift with the PK-232

Last month I talked about the prospect of using the V.23 modem standard to replace the common but inefficient Bell 202 modems that we currently use. I contacted the folks at AEA to ask them how to do this with the PK-232. John Gates N7BTI, Manager, Commercial Products, responded:

Dear Brian,

A lot easier way to get 800 Hz is to leave the receive filters in the 232 as is (1000 Hz wide, centered on 1700) but to pull the discriminator points in to 1300 and 2100 (pots R96 and R81) and to set the AFSK generator (R165 and R167) to those tones also.

You will get a couple dB extra noise from the wider-than-800 filters, but it should not affect things much.

Thank you, John, for the information.

To Packet Where No Man Has Packeted Before

Some time ago a group of packeteers were together. Harold Price NK6K told Bob McGwier N4HY that while watching the movie *Star Trek V* he noticed a sound, reminding him of HF packet, during the scene where Scotty is trying to beam Checkov and Uhura back from the Enterprise. Bob, never one to shirk from a challenge, decided that he would attempt to decode the data to find out if it was indeed a packet signal.

Bob is a specialist in digital signal processing. At his work he has access to a Cray-2 super computer, so he wrote a digital FSK filter and demodulator program to run on the Cray. He then took a copy of the sound track of the movie and digitized the part in question.

On the first pass Bob immediately recognized HDLC flag sequences at the beginning and end of the packet. Bob realized that he did not have sufficient computer time to do the entire decoding job, so he used a plotter to graphically display the data. The nine pages of hard-copy waveform plots, representing about 1.2 seconds of data at 300 bauds, were then turned over to Phil Karn KA9Q for complete demodulation. Using pencil, paper, ASCII chart, and a copy of the AX.25 protocol specification, Phil got to work.

Phil's first job was to recover the clock so that he could tell where each bit began. This he did using the same method as the WA4DSY 56K bps modem; that is, he marked off sampling points where the waveform slope went rapidly through zero, at the center of a mark-space-mark or a space-mark-space sequence. From this he extrapolated where the other bits would appear in the data stream. At this point Phil "sliced" the data into individual bits and performed the NRZI decoding. Phil now had the raw bits that represented most of the packet.

The packet was very noisy and had numerous bit errors. Knowing how things were done helped Phil to make educated guesses. For instance, each byte of an AX.25 address field, except the last one, always has the last bit of the byte set to zero. Also, addresses always contain an amateur callsign in upper case letters. These items helped Phil determine when he might have made a mistake in decoding. Phil even used the callbook to determine if a callsign was valid and if the operator was authorized to transmit packet (General class ticket or higher).

The packet was clearly an HF packet. The control field was an I frame with N(S)=1, N(R)=1, and P/F=0. The protocol ID was hexadecimal F0, indicating that the packet contained text and not a networking protocol.

The text appeared to contain the following (up to where Scotty began to talk again, making further decoding impossible): *>Qt takes 4 program*. This did not look quite right, so he examined the second byte again and noticed that if he changed one particularly sick-looking bit the data then read: *>It takes 4 program*.

The readable portion of the packet was finally decoded. It was part of a QSO between Bill Harrigill WA8ZCN and N6AEZ. Bob McGwier contacted Bill and he agrees that it was probably him since he was very active on packet around the time that *Star Trek V* was being filmed.

This brings up an interesting issue: What is the legality of recording transmissions off the air, and then using them as part of a movie that may itself be broadcast at a later time? The FCC regulations say that you may not intercept a transmission and then retransmit it for profit. I would love to hear the lawyers and government bureaucratic types argue that one.

Standardizing the Radio/TNC Interface

In the *73* packet issue, I wrote an article about standardizing the radio/TNC interface. I received a letter from Miles Abernathy N5KOB telling me that he could not get the desired 300 mV from his MFJ-1270. His TNC peaked out at 81 mV into 500 ohms.

I looked at the schematic for the 1270 to see if there was a way to get more output. There are two resistors, R56 (5.6k ohm) and R57 (560 ohm), that make up an output voltage divider that reduces the signal from the 2206 by a factor of 10. A simple solution is to swap these two resistors so that almost the full output of the 2206 modulator is available at the output of the TNC. Then readjust R76 to get the desired output level.

Well, that's it for this month. *73* and good packeting. ■

Number 25 on your Feedback card

ABOVE AND BEYOND

VHF and Above Operation

C.L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake Ave.
San Diego CA 92119

VHF/UHF Circuit Modules

Several companies have modules available off the shelf for VHF/UHF construction projects and other applications. Many different types of circuits can be made using modules. Mixers, amplifiers and many other circuit types are available from manufacturers of RF and IF signal processing equipment, simplifying your construction project.

Overview of Amplifiers

Basically, amplifiers are quite simple when you use a MMIC modular amplifier. The design of MMICs is advancing rapidly, changing existing circuitry by removing discrete components and replacing them with a fully integrated and contained amplifier or modular circuit. Early MMIC amplifiers were limited to low power devices, such as pre-amplifiers. Now modular devices are available for the low and final power stages of a transmitter. These devices can provide up to several watts of power from low frequencies to over 2 GHz.

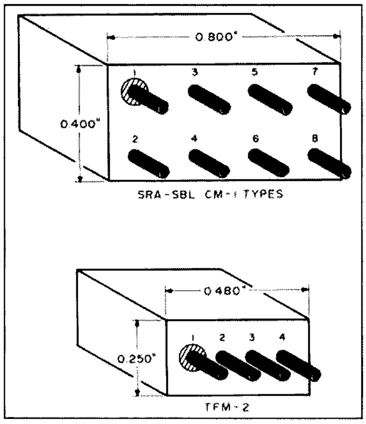


Figure 1. Dimensions and pinouts of common mixer modules.

Gain Blocks for Amateur VHF/UHF Bands

Commercial gain blocks are available for almost any frequency and power output, pre-packaged with power options and RF connectors, but they're expensive, unless you buy them surplus. Several types are available for our amateur VHF/UHF bands.

Motorola has several high power modules for VHF which provide several watts of power. Mitsubishi also makes several similar modules. One of them is the M-57762 for 1296 MHz ($69, RF Parts Co.). With 2 watts of drive, you get 20 watts output at this frequency from this pre-adjusted, no-tune module! All you see is a little block of plastic and heat sink material tied to a few external components.

Many other types of modular amplifiers, covering a wide frequency spectrum, are made for the cable TV industry for line amplifiers. Typical are TRW's CA4101, CA4815, and CA2870 series of wide bandwidth linear amplifiers. Motorola has a similar family of modular amplifiers with a normal frequency response of 40–400 MHz, with some rated to 1000 MHz. There are many different types of amplifiers, depending on CATV applications. I tried several of them for amateur applications, and they work well.

These CATV modular amplifiers provide stable gain of 18 to 34 dB, with maximum power of 100 to 400 mW. It's expensive to use these modular amps for transmitting converters for 50, 144, 220 and 450 MHz. The output power is not rock-crushing, but it's respectable enough to drive a single transistor stage, if desired.

The devices from surplus that I tested had been discarded due to poor performance/bandwidth gains, but they worked fine in a single frequency amateur band gain block. See Figure 4 for an example of a TRW CA-4101 power module.

The CATV gain blocks require about −5 dB drive, just about what a good mixer will have on its output. Now if the wheels are grinding, that means you can take the old HF SSB transceiver (reduced power output), feed it into a simple mixer (pre-packaged), and use a hybrid module amplifier to construct a low power VHF transmitter.

Toss in two MMIC broadband amplifiers for the RF and IF pre-amplifiers, and you have a VHF receiver. Both Avantek and Mini Circuit Labs have MMIC amplifiers covering from DC to 2 GHz, with a flat frequency response and gain of 10–25 dB. This kind of inventiveness is all you need with pre-packaged circuits. Just supply the DC operating voltage, and input/output coupling or filtering between stages. It's kind of like making a tossed salad—roll in the components, and season lightly.

Building with surplus MMIC or CATV amplifiers can be fun and easy. Look for them on surplus PC boards in the junk or scrap piles at your surplus outlet; watch for good parts to build with.

Next month we'll start some projects using several of these MMIC and CATV devices for both receivers and simple gain blocks, with several applications using amplifier modules. This month, let's start with mixer modules and built upon them to form a complete circuit.

Common Mixer Modules

MODELS	GRA-1 All Units	SRA 1	SRA 2	SRA 6	SBL 1	SBL 1X	CM-1	TFM2 All Models
LO	1	8	8	8	8	8	8	4
RF	6	1	3-4	1	1	3-4	1	1
IF	4	3-4	1	3-4	3-4	1	3-4	2
GND	2-3-5	(2 ———	———	5 ———	———	6 ———	——— 7)	3
FREQ (MHz)	DC to 500	DC 500	DC 1000	0.003 100	1 500	10 1000	DC 500	1 1000
COST	$15	$14	$16	$24	$5	$7	$18	$14

(Note: Pin #1 is a Blue Bead)

Mixer Modules

Mixer modules, available from many sources, are easy to use in circuits. Once a mixer is constructed, you can adapt it to almost any other circuit to form a functional amateur band converter.

Use the mixer you have on hand, since most types are interchangeable. Verify the specifications, making sure your mixer will work at the desired frequency. See the Table for the pinouts of some standard mixer modules.

Frequently encountered mixer circuits are made by Relcom, Mini Circuit Labs, and Anzac. Outwardly they resemble a small, hermetically sealed relay with four or eight pins for connections (see Figure 2). The Mini Circuit Labs' SRA-1 mixer, good to 500 MHz, is easy to obtain and familiar to most hams. It requires +7 dB of local oscillator injection. Sensitivity on the RF input is less than a few microvolts.

Making a test mixer is as simple as connecting the appropriate pins to a coaxial connector for RF, IF, and LO. (RF=Antenna, IF=IF amplifier, and LO=Local oscillator). I built a 450 MHz test receiver by connecting a mixer to two different signal generators. I used one generator for the signal test source, and the other for the local oscillator injection.

My ICOM IC-02 2 meter HT served as the IF amplifier in the test, with 300 MHz injection on the LO port and the IC-02 on the IF port of the mixer. I measured 2.5 mV sensitivity at 450 MHz using the second signal generator for test evaluation on the RF port.

Mixer Construction

You can solder coaxial connectors directly to the pins of the mixer module. You might want to make a small PC board to provide

Parts Suppliers

Mini Circuits Labs
PO BOX 350166
Brooklyn NY 11235-0003
(718) 934-4500

Avantek
Woodcreek Plaza Ste. 180
101 W. Renner Road
Richardson TX 75080
(214) 373-3870

RF Parts Co.
1320 Grand Ave.
San Marcos CA 92069
(619) 744-0728

Anzac Electronics
2525N. First St.
Waltham MA 02154
(617) 891-6220

NEC California Eastern Labs
6033 W. Century Blvd., Ste 840,
Los Angeles CA 90045
(213) 645-0985

SHF Microwave Parts Co.
7102 W. 500
S. La Porte IN 46350

(SASE for Flyer on surplus cavity parts)(73 Advertiser)

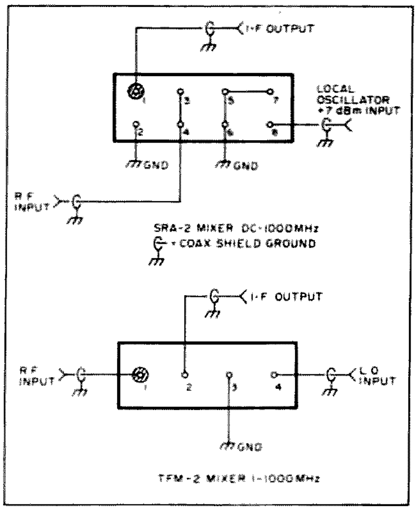


Figure 2. Typical mixer connections.

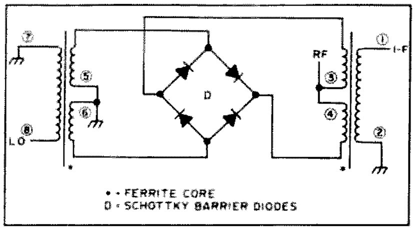


Figure 3. Schematic for basic mixer.

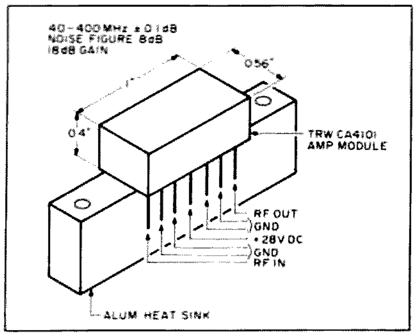


Figure 4. TRW CATV amplifier module.

good isolation for the mixer ports. Just keep connecting leads short. Compared to hybrid circuits composed of discrete components, the mixer module is easy to build. With modular construction, about all you need are a few bypass capacitors.

In Figure 3, I have shown the connections (pinouts) of several mixer circuits with a typical schematic of how they are connected internally. Most devices follow this pattern; only the pin connections may differ.

The TFM-2 mixer has 4 pins: IF, RF, LO, and ground. All the normal grounded pins (as in an 8-pin mixer) are tied together internally. Models may differ in the type of transformer and diodes types for power dissipation and operating frequency.

Mixers in Their Simplest Form

This mixer, what I call a toy project, uses your 2 meter HT to copy public service broadcasts on 157 MHz. All you need is a battery and 11-MHz oscillator. This "toy" works, but don't expect too much. The oscillator provides the difference frequency with your 2m HT, and the product mix (11 MHz plus 147 MHz) is the 158 MHZ public service band.

The Most Dreaded Mixers

These mixers, with poor connections to a metal rain gutter or spout, produce TVI or other interference. Corrosion forms a mixer at the poor joints and other attached metal serves as an antenna. Two high power transmitters, coupling in the rain gutter and mixing together, can re-radiate enough power to cause interference to a nearby receiver.

Inspection of either transmitter will show them to be clean, but the interference will be cured only when one transmitter is shut down or the rain gutter connections are bonded together to break the mixer action.

We had a difficult interference problem we finally traced to a municipal water tower. We had to have the entire supporting structure joints welded together to make good connections.

Other Modular Circuits

Don't assume that the circuit that you see on a PC board is a mixer. There are whole families of frequency mixers, RF transformers, frequency doublers, switches, couplers, attenuators and modulators contained in small, hermetically sealed, 8- and 4-pin packages that operate without adjustment. You have to use a catalog to tell them apart.

Cost is not prohibitive, even if purchased new. For instance, the cost of an SRA-1 mixer is less than $20. The low power MMIC amplifiers are less than $2 each from either Avantek or Mini Circuits Labs. All of these rugged newer modules and MMIC amplifiers can survive some harsh handling, within limitations.

Comments and Mailbox

Henry Armstrong wrote that he had not received a reply from me. I do make errors, and sure did on Henry's account. I pulled his letter from the file and replied at once. I usually reply in less than a week, except during contests, holidays, or when I'm on vacation, so if you have not received yours, let me know.

Mike N2JA/JA1ANE and Yohji KB2DSE/JA1OBF are busy bringing 10 GHz Gunn (Solfan type) transceivers to Japan. Glad to see the activity increase. The biggest difficulty for them was locating Solfan-type cavities. I had a few some time ago, but have since run out, so I sent them a design of a cavity for 10 GHz using a homebrew varactor (to be covered in a future article). I also let him know that devices similar to the Solfan unit are available from SHF Parts Co. in Indiana.

Mark AG8N from Ohio writes, "Thanks for writing the microwave articles in *73*. . ." He's changed his opinion of the worth of 10 GHz operation. He says the telephone company has deactivated one of its sites between Cleveland and Columbus, and part of the site is available. He's looking for other amateurs in the area who could help with 10 GHz related activities. Contact Mark Anders AG8N, 326 Township Rd. 1080, Polk OH 44866.

Ron NØCIH writes, "Recently got two Solfan units and I would like to get on 10 GHZ. Your articles in *73* magazine kind of pushed me towards that band. Hope to see more ideas in the magazine." Richard KA9DUZ reports he is busy constructing the IF amplifier for his 10 GHz system. He has received several Solfan type intrusion alarms to use in this project.

That's it for the mail. I'm looking forward to going in depth on the MMIC amplifiers, both commercial and surplus CATV types, next month. As always, I'll be glad to answer your questions. Please enclose an SASE for a prompt reply.

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

BCNU Later

I am going to ask those of you who are salivating at the thought of "BCNU Part Two" this month to just cool it for thirty days, and let some users of other-than-PC computers and systems have a chance, OK? This pause that refreshes was prompted by two things: a comment by a ham I met recently, to the effect that I tended to ignore some groups to the exclusion of others for several months while developing a topic; and a letter from one of our more RTTY-o-active readers.

On the former prompt, by the way, I was assured that I do not neglect any particular group in my disregard. I seem to be an equal opportunity abuser. It's just that two months in a row devoted to IBM-PC compatible topics might make some of you feel that you're being left out in the cold.

As to the latter prompt, I received a letter from Jack Skubick K8JS in Naples, Florida. Sagacious readers may recall that last November I mentioned the difficulties Commodore C-64 users were having with many of the newer multi-mode terminal units, and general dissatisfaction with the terminal program they might be using. Jack offered a public domain program called THIRDTERM, and was willing to send the program to any user who sent him a paltry $3.

THIRDTERM Response

Jack writes that he received a huge response to this note, with some 120 disks going out by the middle of December. He relates taking an "informal tally" of the contents of the letters that accompanied those requests. Several things began to emerge as he read them, and Jack wonders if the requests come from a representative sample of C-64 users.

He noted that most of the hams requesting the program seemed to be rank neophytes with regards to computers. For many of them, using the C-64 on RTTY may well have been their first exposure to computers. Jack postulated this created the set-up for a far greater problem—oversell.

A good number of the individuals requesting this simple, three-buck program already had a commercial, made-for-XYZ-brand TNC terminal program that either seemed "lacking" or was "awkward to use." A common assumption made by these users was that each different brand of TNC would function only with that brand's coordinated terminal program. He notes that in a good many cases, such programs were poorly written, at best. Additionally, many of the hams entering RTTY were new to these modes, having just transferred from the prima digital mode, CW.

" . . . choose your computer for what it can do as a computer, not whether or not it can talk to your radio."

Many of the questions he fielded were similar to those I receive for this column. Typical ones include: "Is direct FSK output better than audio input into SSB for RTTY?" and "What can be done about those damned 'birdies and buzzes' the computer emits on 10 through 20 meters?" By the way, Jack adds that this is a particular problem with the C-64!

ASCII is the Standard

In short, computerized RTTY is an easy, somewhat glitzy way to enter a new mode. Unfortunately, it may be too easy, too fast, for some. While I know we have touched some of these points before, the number of questions from readers of this column indicates a need for delving into these topics once again.

Let's see if we can clear up a few points here, today. To begin with, the output from about any computer or terminal is normally "standard" ASCII. To the total neophyte, ASCII is the acronym for American Standard Code for Information Interchange. All the letters, numbers, and assorted characters are encoded in seven binary bits. Since the output really does not depend on the generating device, about any computer running any normal terminal program should be able to communicate, at least on a basic level, with any of the ASCII compatible TNCs. Now, if that isn't a broad statement, I don't know what is!

To expand this a tad, I was testing a TNC here at WA3AJR a while back. While the particular unit came with a "dedicated" program, designed for an IBM-PC compatible, and while that program was very nice, it was not the only way to communicate with the device. I located a shareware program for the PC on CompuServe, designed for this particular TNC, which also worked nicely. Additionally, I was able to control, and use, the TNC with the PC running a modem communication program, with a CoCo running a communication program, and with an old-fashioned dumb terminal. So, concerns about a particular computer, or a particular program, may just be overstating the case.

I have said before, and I will say it again now, choose your computer for what it can do as a computer, not whether or not it can talk to your radio. Using your computer only as a terminal for RTTY or AMTOR or packet is a foolish waste of money. If that is all you need, look around for the cheapest solution possible. I shudder to think of someone getting hoodwinked into buying a 386-20 to run RTTY!

CW and FSK

Did I hear "direct FSK"? Sorry, but few rigs I know really run direct FSK. On the other hand, if you put a clean audio tone into modern SSB transmitters, you get a clean signal out. A single tone, made and broken, yields CW. Two tones, alternated at different frequencies, yields FSK. If that is not clear, and you cannot find old issues of RTTY Loop where this was covered, write me, and I'll cover it in detail again. The point is that most of us have no choice but to use audio generation of FSK on an SSB transmitter. I don't think there are too many SB-401s around, for which I addressed this problem some years ago.

Sonic Distractions

Now, about those birdies and bleeps. Yuck! I agree that many computers are notorious for producing these distractions. First, be sure that the computer you are using is FCC certified Class B, for home use. This is the more stringent certification with regard to spurious emissions. Second, be sure all cables and leads entering or exiting the computer are shielded. Finally, if all else fails, punt. Move the ball, the computer, to another location. See if a shift in cable runs, equipment organization, or AC plugs helps. Don't give up.

Jack also indicated that earlier this year he switched to an Amiga computer, and now feels much the neophyte himself. He relates the impression that, unlike entry level C-64 users, hams using Amiga computers seem a bit more versed on the intricacies of this mode.

Popular TNC Programs

I want to thank Jack for his generosity. Along with the program disk, he sent a six-page printout of how to get started with THIRDTERM, including ideas of how to use a terminal program for many different functions around the ham station, and TNC tips and hints. I guess he might still be receptive to inquiries, at 791 106 Ave., Naples FL 33963.

As a little tag to all of this, Jack lists available and popular terminal programs hams are using with their TNCs. We have covered some of this in the reader survey, the results of which were detailed in that same November issue. However, the list Jack proposes, with a little augmentation from me, includes:

C-64:
THIRDTERM (Shareware)
VIPTERM & VIPXL (Commercial)

C-128:
ULTRATERM (Shareware)

Amiga:
ACCESS! (Shareware)
JR-Comm (Shareware)
ONLINE! (Commercial)

CoCo:
RTTY 1-1
Mickeyterm
RTTY.BIN

Apple:
Super-RATT

PC Compatible:
Bitcomm
Procomm
Qmodem

As always, your comments, thoughts, and suggestions on all of this are welcome. Please feel free to send them to me by mail at the address at the top of this column, or via CompuServe (ppn 75036,2501) or Delphi (username MARCWA3AJR). And next month, BCNU . . . Part Two!

Number 27 on your Feedback card

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This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

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HAMLOG COMPUTER PROGRAM Full features. 18 modules. Auto-logs, 7-band WAS/DXCC. Apple, IBM, CP/M, KAYPRO, TANDY, CR8 $24.95. 73-KA1AWH, PB 2015, Peabody MA 01960. BNB775

LAMBDA AMATEUR RADIO CLUB International amateur radio club for gay and lesbian hams. On-air skeds, monthly newsletter, and annual gathering at Dayton. PO Box 24810, Philadelphia PA 19130. BNB812

DOSSAT SATELLITE TRACKING PROGRAM $39.95. IBM-PCs/compatibles, graphics and tabular output, realtime and prediction modes, rotor controller support, geosynchronous (Phase IV) tracking. Satellite Software, PO Box 37, Redmond WA 98073. (206) 868-1040. BNB835

FIELD TELEPHONES wanted. Working or not. Randy POB 546, Randle WA 98377. (206) 497-7233. BNB865

MACINTOSH SOFTWARE: Send for info on exciting ham radio programs. ZCo Corporation, PO Box 3720, Nashua NH 03061. (603) 888-7200. FAX (603) 888-8452. BNB874

DISCOUNT BOOKS, SCANNERS, ANTENNAS: We have radio books and frequency books by TAB, SAM's, ARRL, CRB, McGRAW HILL and others, many at discount prices. FREE catalog. DOYLE COMMUNICATIONS, Dept. B390, Route 8 Box 18, Lake Pleasant NY 12108. (518) 548-5515. BNB885

LOW COST HAM GEAR. SASE for free list. WA4DSO, 3037 Audrey Dr., Gastonia NC 28054. BNB890

SURPLUS CATALOG. 72 pages. $2. Surplus, PO Box 276, Alburg VT 05440. BNB891

WANTED: All types of Electron Tubes. Call toll free 1 (800) 421-9397 or 1 (612) 429-9397. C & N Electronics, Harold Bramstedt, 6104 Egg Lake Road, Hugo MN 55038. BNB900

10 MTR FM HYGAIN CB BOARD with instructions $9.95. FM DET KIT $7.00. 40 Channel Switch $5.00. Crystal $5.00. SQ/VOL Pots $2.00/pair. All for $24.95 plus $2.00 S/H: MORNING DISTRIBUTORS, PO BOX 717, HIALEAH FL 33011. (305) 884-8686. BNB902

DIGITAL AUTOMATIC DISPLAYS. Be specific. 45¢ S.A.S.E. GRAND SYSTEMS, Dept. A, PO Box 3377, Blaine WA 98230. BNB908

HAM-SOFT—Public Domain Software For Amateur Radio. Hundreds of titles, lowest prices, satisfaction guaranteed! IBM, C-64, MAC, VGA Graphics, more. Catalog $1.00 refunded first order. HAM-SOFT, PO Box 2525, Morgan City LA 70381. BNB909

HAM SOFTWARE IBM/Compatibles 10 disks $26.95. MC/VISA/Discover. N5ABV EAPCO/7, PO Box 14, Keller TX 76248-0014. (817) 498-4242. Order Only 1 (800) 869-7208. BNB911

ELECTRON TUBES: All types & sizes. Transmitting, Receiving, Microwave...Large inventory = same day shipping. Ask about our 3-500Z special. Daily Electronics, PO Box 5029, Compton CA 90224. (800) 346-6667. BNB913

WANTED: ICOM IC-22U's...Cliff W6WBK, 2242 Cerrillos Rd., #177, Santa Fe NM 87501. 505-473-2916. BNB915

HAM-SWL-SCANNER BOOKS. Catalog $1. Tiare, PO Box 493/S, Lake Geneva WI 53147. BNB916

COMMODORE 64 HAM PROGRAMS— 8 disk sides over 200 Ham programs $16.95. 25¢ stamp gets unusual software catalog of Utilities, Games, Adult and British Disks. Home-Spun Software, Box 1064-BB, Estero FL 33928. BNB917

100 QSL CARDS $9! Shipping included. Free samples. Shell Printing, KD9KW, PO Box 50A, Rockton IL 61072. BNB921

EASY PCBs using our popular transfer sheets! Inexpensive. FREE details. PCBs, Dept. H1, Box 13534, Kanata, Ontario, Canada K2K 1X6. BNB923

Barnstable Radio Club will hold their Annual Hamfest Saturday March 10, 1990 at The Oak Ridge School Sandwich, Mass. Take Route 6 East to Exit 2 (RTE 130) turn Right follow RTE 130 2 1/2 miles South to Quaker Meetinghouse Road. Setup 8:00 AM sellers 10:00 AM buyers. Tables $8.00 in advance $10.00 at door. Amateur Exams will be given. Contact Don WA1AIC 508-778-5673 or Henry 508-255-2818. BNB924

SLEP SPECIALS MILITARY USM-207 FREQUENCY COUNTER, LATE MODEL SOLID STATE, 0-500 KHZ EIGHT DIGIT READOUT, HIGH STABILITY CRYSTAL OVEN OSCILLATOR, SIZE 19"W x 5"H x 17"D, LAB QUALITY/TESTED, HAVE QUANTITY $185.00, ADD SHIPPING. WRITE/PHONE BILL SLEP, 704-524-7519, SLEP ELECTRONICS COMPANY, HIGHWAY 441, OTTO NC 28763. BNB925

Number 28 on your Feedback card

ATV

Ham Television

Bill Brown WB8ELK
Elktronics
12536 T.R. 77
Findlay OH 45840

ATV Satellite

Of the AMSAT microsats launched in January, WEBERSAT is of particular interest to the ATV community. Built by students at Weber State College in Ogden, Utah, in the Center for Aerospace Technology (CAST), one of its main goals is to transmit still-frame images of the Earth and Moon to ground stations, using its onboard Canon 610 Color CCD Television Camera. This ought to provide us with some spectacular space views. In addition, an ATV receiver on 1265 MHz is part of the package!

Ground control stations can set this satellite up to either send back the digitized camera image, or switch to the ATV receiver and digitize any ATV signals uplinked to it. In essence, this will give us a store-and-forward ATV repeater with the capability of relaying pictures to any part of the world.

Two Types of Image Downlink

1) *Packet Image Data:* One digitized frame of video is stored from either the Color Camera or the ATV receiver. Each picture takes about 166K bytes of memory and about 20 minutes to send back via 1200 baud packet, using the standard microsat PSK data format. The image data is stored in your home computer and displayed with a program which should soon be available from AMSAT.

Since 20 minutes will normally be longer than one pass over your QTH, you may have to receive two passes to see the whole picture. The software in your computer will pick up only the data it needs to fill in the holes on the second pass. In this mode, just one freeze frame image will be sent back during several orbits.

Necessary Equipment: You will need a 70cm SSB receiver and a medium gain antenna with Az-El mounting, a PSK modem (available from TAPR or PAC-COMM), a packet TNC, and an IBM or compatible PC.

2) *Fast Video Download:* To produce an audio signal representing the digitized image, clock the data through a D-to-A converter on the spacecraft at a rate 1000 times slower than the original digitization. Then send this audio signal out via the narrowband FM voice channel on 437.075 MHz (a form of SSTV not directly usable by a regular SSTV converter). This transmission takes only seven seconds per picture, and you can set it up to send just one image during the pass, or to provide a continuous acquisition and relay of the ATV uplink.

The Fast Video download will be the most interesting mode for the ATV uplink user, as you can quickly see whether your signal is making it up to the bird. You need only an audio tape recorder to store the images you receive. This can then be played back through an inexpensive audio A to D converter for storage and display on your computer. At the time of this writing no interfaces are available for real-time display of the fast video downlink, however I imagine it won't be long before a hardware interface is available to do this.

Necessary equipment: FM receiver on 437.075 MHz, Turnstile or J-Pole antenna, audio recorder and an IBM PC or compatible. At Weber State, programmers are writing software to decode both video transmission modes using an IBM PC supporting various graphics cards (EGA, VGA and possibly CGA). Dr. Robert Summers has written a program to print out a high-resolution image on a standard dot matrix printer and to perform some filtering and manipulation of the image. Other programs written by Bob Argile and Chris Williams will support the compression and decompression of the video data and allow extraction of RGB color images from the digitized image. These programs should be available from AMSAT during the Dayton Hamvention in April, or write to AMSAT, PO Box 27, Washington, D.C. 20044.

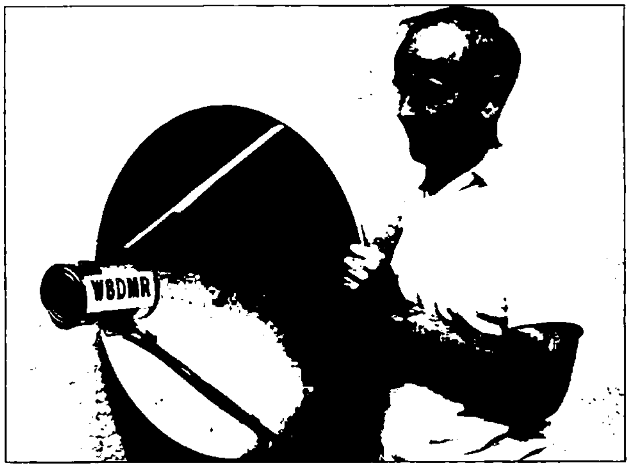


Photo A. W8DMR demonstrates his 2-foot dish for the 13cm ATV band.

ATV Uplink

Initially, uplink attempts will be scheduled with the satellite command center at Weber State or by control stations around the world. This is necessary in the Packet Data downlink mode, as the satellite must be commanded to take up to 24 freeze-frame images at a prearranged time. We won't know if anything made it to the satellite for several minutes.

However, in the Fast Video downlink method, the satellite can be programmed to snatch an image, send it down in seven seconds, and then repeat the cycle. In this mode a prearranged schedule won't be necessary, and it should allow many stations to relay through the satellite. To relay just one station's picture to the other side of the world, the control station will have to program the satellite to digitize and hold the one frame for as many passes as desired. The beauty of this satellite is that it is totally programmable in many different configurations.

What will it take to uplink? The satellite will be about 310 miles away at closest approach during an overhead pass. It'll be over 1500 miles distant on the horizon. Since the ATV receive system consists of a dipole, it's going to take a lot of power to uplink a decent picture to the bird. Your best chance is to wait for a high elevation pass and hit it with all you've got into an Az-El steerable array. Use a large, high contrast callsign (black letters on white background or vice versa).

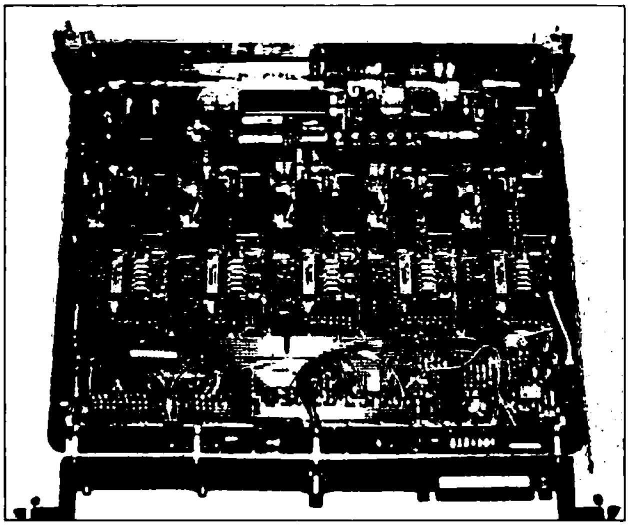


Photo B. The WEBERSAT module before final assembly

Predictions and Actualities

Path loss calculations for 1265 MHz have been made which indicate that to achieve a somewhat snowy P3 to P4 picture with some color will require a 100 watt transmitter into a 22 dBd gain antenna system (4 stacked yagis or a 4-foot dish). 18 watts into the same 22 dBd gain antenna will give us a snowy P2 at best, and sync bars at the maximum range. If you have an 18 watt transmitter and just one yagi (approx. 16–18 dBd), you still might get a discernible picture (P1) into the satellite at closest approach.

Tests at Weber State have shown that a 10 dB C/N signal

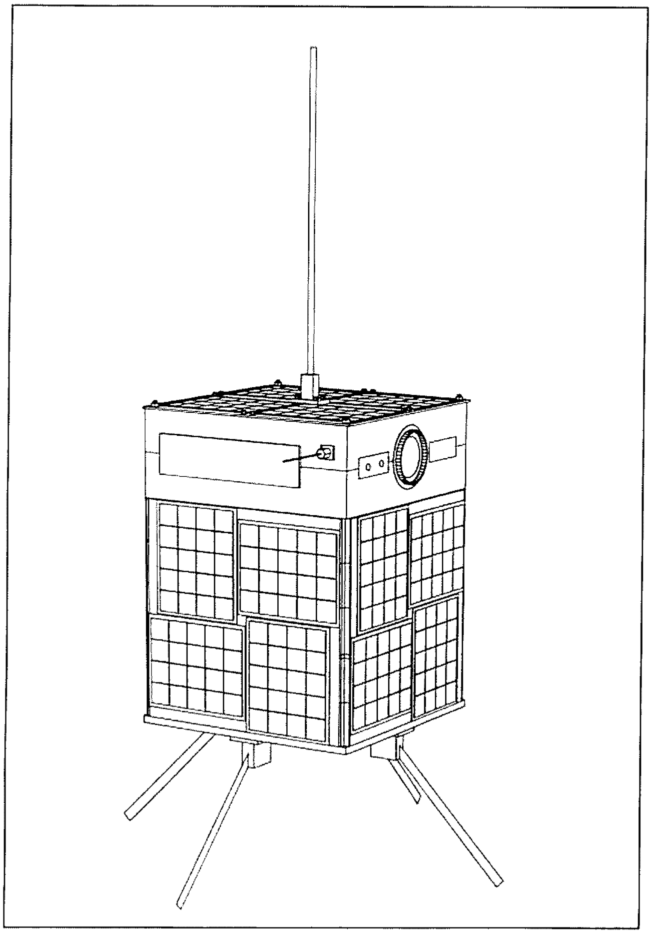


Photo C. Drawing of WEBERSAT by Dick Jansson WB4FAB, AMSAT-NA. Note camera lens on the side of the top module.

(about P1) can produce a fair picture, particularly after performing some image processing on the data with your ground computer. It looks like it would take a 100 watt transmitter to a 27 dB antenna (7 foot dish) to produce a virtually snow-free picture.

Don't give up if you have just one yagi. Comparing predicted reception to actual reports from the last few ATV balloon flights over the Midwest showed between 5–10 dB improvement over calculations. This may have something to do with the way the eye integrates noise to enhance the picture. Although the satellite's computer won't see the picture in the same manner as our eyes, it's possible the uplink will work better than calculated. A single yagi station may do much better than expected. It's certainly worth a try!

Those with 1265 MHz transmit capability who would like to arrange an uplink schedule should contact Robert Twiggs, Director, CAST, Weber State College, School of Technology, Ogden UT 84408-1805. You could also contact me at the above address, as we are working with Weber State to collect a list of potential uplink stations.

Equipment Sources

Getting started on 1265 MHz ATV is not as difficult as it used to be. Ready-made 1 watt ATV transmitters, as well as antennas, are available from P.C. Electronics, 2522 Paxson Ln., Arcadia CA 91006-8537. Antennas are also available from Downeast Microwave, Box 2310, R.R.#1, Troy ME 04987; Spectrum International, PO Box 1084, Concord MA 01742; and Wyman Research, R.R.#1, Box 95, Waldron IN 46182 (they also carry a line-up of FM ATV transceivers for the 900 and 1200 MHz bands).

Getting a fair amount of power is becoming easier with amplifiers available from Downeast Microwave. One of these Downeast units fed into a high-powered tube amplifier from Hi-Spec (PO Box 387, Jupiter FL 33468) should get you above 100 watts. If you wish to roll your own exciter, see the method described in the Oct. '89 and Jan. '90 issues of *ATVQ* about how to achieve a stable 2 to 6 watt 23cm ATV transmitter using a P.C. 80 mW test generator combined with a commercially available M-57762 or SC-1043 power brick.

The Higher Bands

ATV activity is picking up in the bands above 70cm. OSCAR satellite users will find it fairly easy to join in the fun on both the 70cm and 23cm bands, as they probably have good antennas and low-loss feedlines already in place. Those with the ICOM or Yaesu 1200 MHz satellite rigs will find that it only takes a plug-in ATV module.

The 900 MHz and 1200 MHz ATV bands provide a way of escaping the crowded 70cm band and enjoying interference-free video (although some FAA and coastal radar produce some interference). Even though the path loss is higher on these bands, this usually can be made up with higher-gain antennas. Coax loss becomes one of the main limiting factors at these frequencies; therefore mounting preamps or receive converters at the antenna produces the best results.

Many 70cm ATV repeaters have an output (or input) in the 900 MHz or 1200 MHz bands. This gives you the advantage of being able to see your signal come back through the repeater. No longer do you need to guess how well you're making it into the system. With one station transmitting on 439.25 MHz, and the other on 910.25 or 1265 MHz, full duplex ATV is possible.

DX is possible on the 1200 MHz band. One of the longest contacts recorded on this band for ATV was between W5VDS in Texas and WA4GRK in Florida (941 miles)! At these higher frequencies, we can experiment with FM ATV without interference to other modes.

Defrost and Broil

Many ATVers are using converted TVRO satellite receivers to view these signals. Dave Pacholok KA9BYI demonstrated at the Dayton hamfest that you can even use microwave ovens to send high power ATV on the 2300 MHz band ("defrost" for local contacts, and "broil" for that rare DX).

This suggests the possibility of using cheap MDS converter boxes for receive. You can find MDS converters, along with small dishes, at many hamfests. If you want to experiment, an MDS receiver kit is available from K & S Electronics, PO Box 34522, Phoenix AZ 85067. Ernie WB6BAP has used a 10 GHz Gunnplexer system to establish a link each year at the Rose Parade with excellent results, and he's even video-modulated a laser beam.

The 900 and 1200 MHz bands should become more popular as activity increases. Over the next few years, ATV from the shuttle, as well as the space station, will probably use the 1200 MHz band because of its international appeal.

Each Tuesday night at 8 pm on 3.871 MHz, the ATV NET gives updates on the WEBERSAT experiment. Also check local packet BBSs and the AMSAT nets for the WEBERSAT operating schedule. 73

QRP

Low Power Operation

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

Real Radios Glow in the Dark?

With the warmer weather of spring, the hamfests begin to appear. It's a good time to start restocking the junk box from a long winter of construction projects. A good source has been, and continues to be, old CB radios. But even in the '90s, we can't live by transistors alone.

In the May 1987 QRP column, I did a small, one-tube transmitter called the 6L6 Special. That one project generated a tremendous amount of mail and even a few more columns just for modifications of the basic transmitter. If you would like a reprint of the original article, write to *73 Magazine*.

I hoped to have some good info on converting ICOM radios for true QRP operation, but I didn't receive it in time for this column. Maybe next month. In the meantime, dig out the solder gun and try your hand at this transmitter. Real radios glow in the dark.

If the 6L6 Special had but one thing wrong with the basic design, it would be that it used only one tube. The 6L6 was both oscillator and power amplifier. While there is nothing wrong with the circuit, it could be tuned up in such a way as to cause the CW tone to chirp or do other nasty things. Really only one way around this problem—a separate oscillator.

A New Transmitter

This time around, we'll use two different types of tubes. A 6C4 is used in a Pierce oscillator driving a 6AQ5 as an amplifier or doubler.

In place of the RF choke usually found in the plate circuit of a Pierce oscillator, a 100k ohm resistor works satisfactorily. This also keeps the plate voltage down to a reasonable value. A 330 ohm resistor in the cathode return provides the 6AQ5 with protective bias.

A standard ¼" jack is provided for keying both cathodes simultaneously. You can also include a 100 mA meter in the cathode of the tubes, to measure the total amount of current being drawn. This also makes tuning up the transmitter easier.

Shunt-feed is used in the amplifier so the B plus voltage is not exposed on the tank coil. Remember, of course, that in operation even this small transmitter can yield a nice RF burn.

Because the miniature tubes require a very small footprint, you can easily build this transmitter in a small utility box. Radio Shack has a very good selection of small boxes.

The tank circuit is tuned with an air padder capacitor. Of course, you don't have to use a padder capacitor. You can use a capacitor with a standard ¼" shaft, but you really don't have to do much adjustment to bring the transmitter to resonance. In fact, because of the untuned Pierce oscillator circuit and just one tuning control, this little rig is capable of changing frequency and bands very promptly.

Power requirements for the transmitter are very diet-like. The filaments require 0.6 amp at 6.3 volts and about 300 volts for the plate of the 6AQ5. You should be able to get about 5 watts out of the rig with 300 volts on the plate. Don't get power hungry and try for more power by applying a higher plate voltage to the 6AQ5. It just won't take it; at least, not for very long.

Constructing the Power Sypply

Building the transmitter is a bit different from what most of us young guys are used to. The power supply components will be the hardest to come by. Don't give up the ship quite yet! You can use two 12 volt transformers connected back to back. This will give you 120 volts AC. Adding a voltage doubler will deliver the required 300 volts or so.

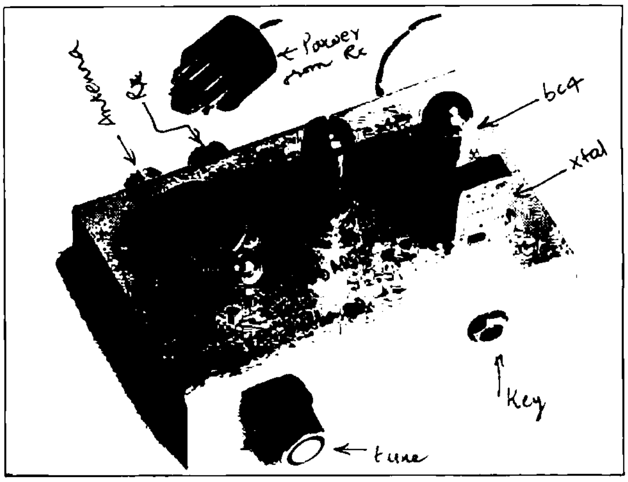


Photo A. Note the 6AQ5 in the center of the box, and the 6C4 to the right.

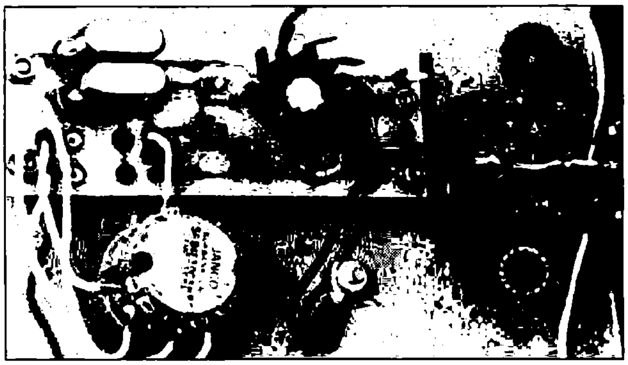


Photo B. Here's the whole thing. This one has the 3553, so it has the heat sink on it. The crystal switch doesn't come with the kits. A better band switch is now provided.

A good source of the high voltage capacitors for the power supply are photo flash capacitors. All Electronics has a good supply of them at a fair price. You'll need to add capacitors in series and then parallel some to get the required capacitance. Nothing real critical, but use the most you can get your hands on. Also, don't forget to add bleeder resistors across your capacitors. You don't want to get knocked on your butt by touching a charged cap, do you?

A good supply of wire terminal strips will help in getting the rig up and running. You can also use any number of methods of connecting the antenna to the rig. A good method would be phone tip jacks, banana post jacks, or even an SO-239.

The link for the antenna is a bit different. You could redesign the circuit and install a PI type output tuning circuit. The original circuit requires a National AR16-40E, a part Radio Shack no longer stocks! Unless you have a very, very big and deep junk box, you'll be out of luck on this one. However, you can make your own. If you have a grid dipper, so much the better.

Wind 30 turns of #24 wire around an old coil form or pill bottle. Set the 100 pF capacitor to about halfway. Find the frequency of resonance using the grid dip meter. If you can't get a dip while moving the tuning capacitor through its range, remove some turns and try again. Remember, 80 meters will require more induc-

Continued on page 78

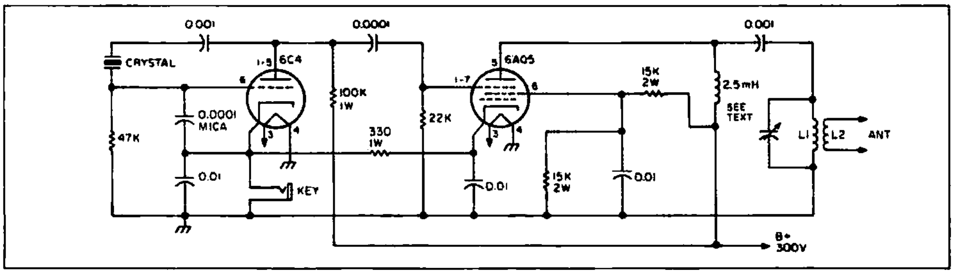
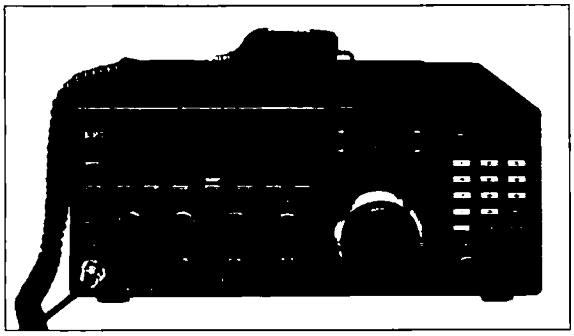


Figure. A 6C4 is used in a Pierce oscillator driving a 6AQ5 as an amplifier or doubler.

NEW PRODUCTS

Compiled by Hope Currier

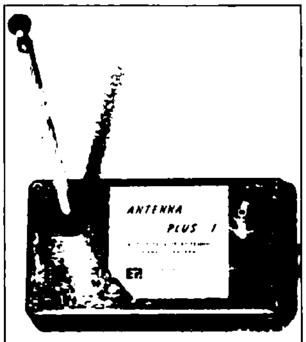


PRODUCT OF THE MONTH

JAPAN RADIO CO., LTD.

Japan Radio Company, Ltd. has introduced the new JST-135 HF transceiver. The JST-135 is a general coverage receiver designed for high-performance DX communications. It has microprocessor-controlled variable front-end tuning to enhance selectivity and dynamic range. Six interference rejection techniques, including the newest "notch follow filter", ensure high quality QSOs. The heavy duty transmitter uses a low-distortion power amplifier to reduce high-order IMD, and a specially constructed heat sink provides continuous full-power transmission. A one-chip direct digital synthesizer (DDS) ensures high C/N and high-speed response. The JST-135 is built to professional standards, and offers many other advanced features and options.

The suggested list price for the transceiver is $2,199. The optional accessories range from $8–$15 for manuals to $914 for an automatic antenna tuner. Contact *Japan Radio Co., Ltd., 430 Park Ave., 2nd Floor, New York NY 10022. (212) 355-1180.* Or circle Reader Service No. 201.



ELECTRON PROCESSING, INC.

The ANTENNA PLUS-1, a new compact, indoor receiving antenna from Electron Processing, Inc., eliminates the need for huge outdoor antennas. It will sit on any convenient surface near your receiver and will provide ideal reception from shortwave through scanner frequencies, including FM and TV.

The ANTENNA PLUS-1 uses a proprietary coupling network and state-of-the-art MMIC chips that make its 36" telescoping whip perform like antennas hundreds of feet long. It's small, rugged, and unobtrusive, but it will still bring in the most distant stations. The internal amplifier guarantees peak performance from 500 kHz to 1300 MHz. The antenna will connect to almost any type of receiver—you can choose BNC, F, SO-239 (UHF) or N connectors. Power comes from a standard 115 VAC (12 volt DC and 220 volt Europower are also available. There is also a version with a built-in antenna splitter and a second output jack.

Pricing starts at at $90 (limited-time introductory offer: $80) for the standard model and $110 for the dual output model. Quantity discounts available. Contact *Electron Processing, Inc., PO Box 68, Cedar MI 49621, (616) 228-7020.* Or circle Reader Service No. 203.

BRIAN BEEZLEY

The MN program for the IBM-PC analyzes antennas made of wire or tubing. MN Antenna Analysis Software, version 2.00, computes forward gain, front-to-back ratio, beamwidth, sidelobes, angle of radiation, current, impedance, SWR, near-field intensity, and far-field radiation. Antennas may be modeled in free space or over real earth, at any frequency. MN plots antenna radiation patterns in polar or rectangular form on CGA, EGA, or HGC screens.

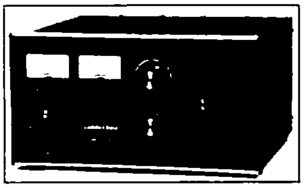
MN, an enhanced version of MININEC from the US Naval Ocean Systems Center, computes interaction between antennas and stacked arrays. Price is $75 postpaid ($79.50 CA & foreign). Upgrade to MN 2.00, $50 ($53 CA & foreign). MN is available on 5.25" or 3.5" disks.

Also available is the YO Yagi Optimizer Software, version 2.00 for the IBM-PC. It optimizes design for maximum forward gain, best pattern, and minimum SWR. YO can compute several trial designs per second. Yagis having up to 50 elements may be modeled, at any frequency.

YO includes models for gamma, T, hairpin, and beta matching networks, element tapering, mounting plates, and frequency scaling. Version 2.00 includes a new gain-F/B-SWR tradeoff mechanism for improved design. You can now also optimize yagis across a frequency band. Lobes to the rear or side of the pattern may be minimized, using peak or average sidelobe power Full EGA color. Enhanced plotting and dot matrix printing. YO is $90 postpaid ($95.40 CA & foreign). Upgrade for previous purchasers, $60 ($63.60 CA & foreign).

Both programs are available on 5.25" or 3.5" disks from *Brian Beezley K6STI, 507-½ Taylor St., Vista CA 92084.* Or circle Reader Service Number 202.

AMERITRON



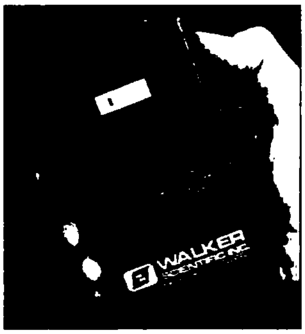
Ameritron has released the new AL-82 full legal power linear amplifier with two 3-500Z transmitting tubes. The AL-82 has dual illuminated meters. One meter gives a constant reading of grid current, the most reliable indicator of overall amplifier performance. The multimeter displays plate voltage, plate current, peak RF output power and drive power/ALC.

An 1800 watt continuous commercial service-rated hypersil transformer is standard, along with heavy duty rectifiers in a full-wave bridge supply with computer-grade capacitors. Two bias settings allow either RTTY and CW operation at 1500 watts of continuous output at nearly 70% plate efficiency or low distortion 1500 watt PEP SSB, SSTV, or AM output. Silver-plated tank components provide high efficiency operation above 20 meters. The Pi-L tank circuit permits full impedance matching over the entire 160 meter band. The tuning capacitors and bandswitch have a 35% safety factor to virtually eliminate tank circuit component failure, even under adverse operating conditions.

The cooling system keeps the components and 3-500Z tubes safely below the manufacturer's ratings, even while operating continuously at 1500 watts output with a steady carrier. The filament supply has inrush current limiting to insure maximum tube life. Complete shielding and bypassing helps prevent TVI and RFI at the high power levels developed in the AL-82.

The AL-82 covers 160, 80, 40, 20 and 15 meters and gives 80% rated output on 12 and 17 meters. In addition, it can be modified to cover 10 meters upon presentation of a proper amateur license. An export model is also available.

The AL-82 retails for $1995. Contact *Ameritron, 921 Louisville Rd., Starkville MS 39759. (601) 323-9715, FAX (601) 323-6551.* Or circle Reader Service No. 204.



WALKER SCIENTIFIC INC.

Walker Scientific's ELF-50 Field Monitor is a new, low cost monitor for measuring potentially hazardous low level electromagnetic field radiation generated by power lines, TVs, VDTs, appliances, and other equipment. It is a hand-held instrument that measures the extra-low-frequency (ELF) electromagnetic field radiation generated from any AC 60 Hz device. It's easy to operate—just switch it on and place it wherever you suspect an ELF. An illuminated 10 segment LED display will show the amount of radiation present. There are two switch-selectable measurement ranges: a low range from 1 to 512 milligauss, and a high of up to 51.2 gauss. The meter is powered by two 1.5V AAA batteries (a low battery indicator light is included).

The ELF-50 Field Monitor's list price is $180. Contact *Walker Scientific Inc., Rockdale St., Worcester MA 01606. (508) 852-3674.* Or circle Reader Service No. 205.

Number 33 on your Feedback card

73 INTERNATIONAL

edited by C.C.C.

Notes from FN42

Sad news! Bryan Hastings NS1B, a 73 editor, has left (December 15) after quite some time with the magazine. I am sorry to see him leave. He has been very supportive and helpful to me during my transition from ham to amateur writer (and I really do mean amateur).

But we all have to make some moves to fulfill our visions, and it may just be that time for Bryan. 73 and Godspeed, Bryan.—Arnie N1BAC

Roundup

Ireland From the Irish Radio Transmitters Society (IRTS) Newsletter:

Following their success in achieving the first moonbounce QSO out of EI on 2 metres in November 1987, the East Cork Group realised that their setup, consisting of four home-brew '2BCX yagis, was not good enough to sustain regular moonbounce QSOs. They decided to build a new station so they could compete in the ARRL moonbounce contest.

Nothing really came together until the summer of 1989, when the group heard that a Dutch expedition was coming to the south of Ireland to attempt a 2 metre trans-Atlantic QSO. After some heated meetings, they decided to attempt build it before the Dutch arrived. D-Day was July 4, 1989. Work on the portable mast, the biggest job in the project, was underway the next day.

The eight antennas are Met 19 element NBS yagis with 14.2 dB gain each, and the transmission line is solid jacket coax with relay switching at both ends. A masthead preamp is used with a separate receive line. The amplifier was built from a Bill Orr W6SAI design, and used a 3CX1500/8877 bottle. Despite the last minute finish, it performed very well on site.

The weeks leading up to the event were hectic. Transportation of all the gear was a nightmare [*I won't go into all the details—Arnie*].

On D-Day the 2 metre array had to be built from scratch on site. The aerials were assembled, phasing harnesses cut, and the station was on the air by teatime on Tuesday, just an hour behind schedule. [*Can't miss teatime!—Arnie*]

HF conditions were excellent for the week. There was some difficulty in maintaining contact with the VHF operators on the other side, due to the large numbers of stateside stations who wanted to work EI. It was nearly as bad as the ARRL contest.

Unfortunately no signals were heard from across the Atlantic on 2 metres, and there were no reports of EI7M's signal being heard. While the transatlantic barrier was not broken, the group was pleased with the effort and learned much for the next attempt.

Japan From *The JARL News*: 270 people from all over the country participated in the '89 Fox-teering National Competition which was held on November 5, 1989 at a park in the suburbs of Tokyo, under the sponsorship of JARL.

This competition gathered an international flavor with 12 participants from China (CRSA), 11 from Korea (KARL), and 1 from the USA.

The champions were Mr. Tadashi Makino (JS1KAU) of OT class, Mr. Shuichi Ogura (JH4EIY) of OM class, Miss Zhang Yi Bin (CRSA) of YL class, and Mr. Oing Zhu (CRSA) of JN class.

30th Anniversary

It is thirty years since Japan Amateur Radio League (JARL) started as an authorized public corporation under the jurisdiction of the Ministry of Posts and Telecommunications back in 1959 (JARL was originally established in 1926). JARL held a celebration ceremony and a banquet to commemorate the occasion on December 1, 1989 at Hotel Okura at Toranomon in Tokyo.

[*Congratulations from the ham community at 73 Magazine!*]

Sweden From *Radio Sweden*: The newsletter reported on the San Francisco earthquake, listing the television and commercial radio stations that went off the air, and those that were able to stay on the air. Some station antenna towers crashed and other stations' outputs were reduced in power.

It also reported that "As usual, radio amateurs provided emergency communications. Ham radio reports from the earthquake zone could be heard on 14275 and 14280 kHz. Locally, 145.150 MHz carried a lot of activity."

Switzerland From the International Telecommunication Union (ITU) Press Releases:

Dr. Pekka Tarjanne, of Finland, took office 1 November 1989 as the new Secretary-General of the ITU. Dr. Tarjanne replaces Mr. R. E. Butler who will return to Melborne, Australia after serving the ITU for the last 21 years, as Secretary-General since 1983.

From 1977 until his election as head of the ITU, Dr. Tarjanne was Director-General of Finnish Posts and Telecommunications, Finland's largest employer with 44,000 employees.

AUSTRALIA

Ken Gott VK3AJU
38A Lansdowne Road
St. Kilda, Vic. 3183
Australia

WIA AWARD

From the vantage point of the WIA Federal Awards Manager, the WIA 80th Anniversary Award got off to a flying start with the DX—but not so good with the locals.

On November 21 I posted eleven certificates, all to North American stations, but nary a one to a VK.

Mind you, the VKs have to make 80 QSOs to win the award (with some concessions for using the WARC bands), while the DX need only work eight.

Anyway, No. 1 certificate went to Michael Pagan N2GBH, who qualified at 1240 UCT on November 4, two minutes ahead of Howard Hatch AB4DU who had to be content with Certificate No. 2 endorsed "first for North Carolina."

Another few minutes back was Walter Stewart KM4RX, No. 3, and first in Florida. Low-number certificates with state firsts have also gone to Louis Vogel KC3VE (Maryland), C. Edward Fox W8NDP (Ohio), Esther Watkins AB4PB (Alabama), and Fred Tandy WA5TUA/5 (Mississippi). Bruce Balla VE2QO received certificate No. 6, the first to go to Canada.

The award is open from Nov. 1, 1989 to Dec. 31, 1990.

Calendar for March

1—Heroes Day, Paraguay; St. David's, Wales; Independence Day, South Korea
2—Peasants Day, Burma
3—Independence Day, Morocco; Alexander Graham Bell, 1847; National Unity Day, Sudan
6—Independence Day, Ghana; International Woman's Day, USSR
8—National Day, Syria, Libya
9—Decoration Day, Liberia
10—Labor Day, South Korea; National Day, Tibet; Holi, Hindu
11—Magha Puja, Buddhist Purim; Jewish Pourim
12—Commonwealth Day, Great Britain, Swaziland, Tag; National Day, Gabon
13—National Day, Grenada
14—Albert Einstein, 1879
15—Ernest Samuel Beoku-Betts, 1895
16—Eiichi Shibusawa, 1840
17—St. Patrick's Day, Ireland, USA; Mirambo, 1840
18—Mothering Day, Great Britain
19—St. Joseph's Day, Spain, Italy, Malta
20—Independence Day, Tunisia
21—Vernal Equinox Day, Japan; Johann Sebastian Bach, 1685; No Ruz, Iran, Iraq, Bahai
23—Pakistan Day, Pakistan; Kanzo Uchimura, 1861
25—Independence Day, Greece; Bela Bartok, 1881
26—Independence Day, Bangladesh
27—Armed Forces Day, Burma; Gudi Padua, Hindu
28—British Evacuation Day, Libya; Beginning of the Month of Fasting, Ramadan
29—Youth Day, Taiwan
31—National Day, Malta


WIRELESS INSTITUTE OF AUSTRALIA
80th Anniversary Award
1910-1990

On March 11, 1910, wireless experimenters came together at the Hotel Australia, Sydney, in a spirit of friendship and common purpose. Their aim was to unite for the protection and advancement of their pursuit. The world's oldest radio society, the Wireless Institute of Australia, was thus founded

1910 - 1990
WIRELESS INSTITUTE OF AUSTRALIA
80 Years of Service

This is to certify that ....SAMPLE....
has submitted satisfactory evidence of having communicated with the required number of WIA members in its 80th year.

Special Endorsement: First station in Lower Slobovia to qualify.

Dated .... Certificate No .... President ....

Photo A. WIA 80th Anniversary Award. Supplied by Ken Gott, VK3AJU, Federal Awards Manager and 73 Hambassador.

Tasmanian Devil Award

One of the most popular VK awards is the Tasmanian Devil, named for a marsupial carnivore (Sarcophilus harrisi). It is about 28 inches long in body, with a 12-inch tail. It got its name from a screaming (some say snarling) cry. It hunts by night—birds, lizards, smaller mammals and poultry, if available.

The Tasmanian Devil Award, run by the VK7 Division of the WIA has been available for many years, and several hundred certificates have been issued. Its weekly net on the 3.5 MHz band never fails to materialize, and it's generally a well-run operation.

Net controller Bob VK7NBF now wants to spread the Devil's wings, to slightly mix a metaphor, and give the DX a chance to get the award. This will involve operations on 28 or 21 MHz, or both (Bob doesn't have 14 MHz privileges) which immediately raises skip problems–meaning that Bob, as net controller, won't be able to hear his fellow VK7s, even though the DX is hearing them and him.

We all know that there are ways around these problems, with shared net control, relays, and other arrangements.

All being well, the Devil Net might have some Stateside accomplices in 1990 and nets on 28 and/or 21 MHz. We'll keep you posted if the plans work out.

That's all for the moment, so back to painting the inside of the new shack. Manpower for this and other necessary renovations around home has been augmented by one hired Boy Scout. He's a good worker. [*Are you also making him into a ham, Ken?*]

Late spring, with summer to come. Too early to plan for the field day contest in the fall, but not too early to dream about it. Cheers, 73, Ken VK3AJU.

CYPRUS

Aris Kaponides 5B4JE
P.O. Box 1723
Limassol, Cyprus

Sporadic-E on VHF

During last June there were some excellent sporadic-E openings on VHF. These openings were observed on 7, 9, 12, and 13 June. Laurence 5B4SA has worked Italian, Yugoslavian and Hungarian stations, and I (Aris 5B4JE) had a QSO with YU8DM on the 13th of June. During this period, I had many VHF contacts on tropo with Ralph 4X1IF, exchanging information about the sporadic-E propagation. The largest openings were on the 7th and 9th of June, and on the 12th and 13th, of very small duration—about 10 minutes. Ralph also said that he worked OE3XUA for the first time.

Visiting Hams

Cyprus, being a holiday island, has many ham visitors who come mainly from Europe and operate /5B4 either with handhelds on VHF or HF from club stations and shacks of local hams.

In Limassol we had G4VOF, GØADU, GØHUB, GØMBM, and DJØMAF. Many other visiting hams were in Nicosia, Larnaca, Paphos, Protaras and Ayia Napa.

I would like to remind readers that temporary /5B4 licenses are issued to hams from EEC countries and the USA, if they write to the "Chief Communications Officer, Ministry of Communications and Works, Nicosia, CYPRUS." The letter should state the dates of arrival and departure, the place of residence, equipment (type, model, ser. no.), mentioning that it will be re-exported. Visiting amateurs should also enclose a photocopy of their licence. Also notify the Cyprus Amateur Radio Society by sending copies of the letter and licence that they have sent to the licencing authority.

To the best of my knowledge the temporary licences are issued

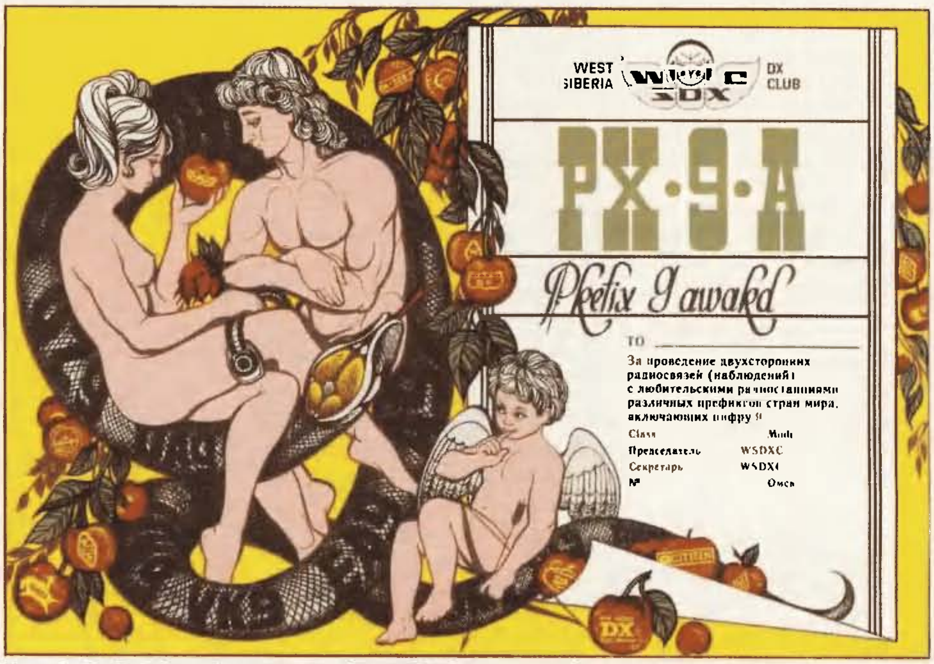
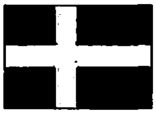


Photo B. Prefix 9 Award from the West Siberia DX Club, sent by Gennady UA9MA, 73 Hambassador. This is the last of the series of six awards.

free of charge, but applications should be made well in advance.

Activity

About a dozen hams are active on the HF bands and two or three are also active on the new WARC bands, mostly on 18 MHz. On the packet side, the top operator and godfather of packet in Cyprus is Costis 5B4TX, who runs also a BBS Digipeater VHF/HF with the call 5B4TX-6 and is QRV almost 24 hours on 21.107 MHz and 144.675 MHz. He has a direct link with Jim 4X1RU, Preben OZ1FYW, and Gabriele IK4BLV.



SWEDEN

Rune Wande SMØCOP
Frejavagen 10
S-155 00 Nykvarn
Sweden

Worked Sweden on 50 MHz yet?

If not, chances are better now! Since March 1989, 25 Swedish hams have had the permission to use 50.0 to 51.0 MHz on a trial basis. Due to TV transmitters on Channel 3 (55 MHz) certain restrictions were put on the licensees. The Effective Radiated Power (ERP) was set at levels 3, 10 or 50 watts, depending on where the stations were located, and transmission was not allowed during TV hours.

So far, the outcome has been positive, although the best conditions, of course, occurred during TV hours when no transmission was allowed. Seventy-five percent of the licensees had been active in the first six months.

The trial period has been extended to December 31, 1990. The number of licensees has been increased to 100 and transmission is now allowed also during TV hours. The power limits, however, remain the same. Eligible for 50 MHz are those having class A or class T licenses (T = Technical, no Morse code required).

SM DX-ers' Meeting

Lake Wettern DX-Group, SK6WW, organizes the Swedish DX-ers' get-together in October each year. This time the small town of Karlsborg (not to be mixed up with the Danish beer Carlsberg) hosted the meeting, and Ken SM6CTQ, together with other local hams, arranged for equipment exhibitions, slide shows from DX-peditions, contest keyer demonstrations, pile-up contests, and demo of DX-cluster on packet radio.

Among the one hundred participants, two well-known DX-peditioners were there telling about their plans. Erik, SMØAGD has since returned from his successful African DX-pedition to Equatorial Guinea 3C1AG, Sao Tome S9AGD, and Annobon 3CØGD. Erik traveled from 3C1 to S9 via Madrid and Lisbon, which was quicker and more convenient than via mainland Africa. To 3CØ he went with friends from S9 by boat.

Erik has developed a new method of handling those huge pile-ups. He has modified his IC-735 so that he easily can scan the memories on receive and automatically switch back to VFO on transmit. By scanning the specific frequencies he regularly announces, he can work many more stations than otherwise possible in the very jammed pile-ups. This method is especially good on SSB but works also on CW. Being alone on a DX-pedition like this is tough, but thanks to no equipment failure and very little sleep, he worked 15,800 QSOs, 6,500 from 3C1, 3,500 from S9, and 5,800 from 3CØ. QSL to his callbook address.

Mats SM7PKK is on his second Pacific Tour. He is planning to stay there about half a year. Being a tall, 21-year-old blond Swede, he certainly draws attention out there! After last year's trip, Mats worked double shift in order to finance his next trip. He was very determined on traveling again with his radio as only companion. You may have already worked him from several rare spots like 5W1, ZK1, ZK3, KH8, and 3D2.

HAMVENTION
Ham of the Year

If you want to nominate an amateur for this award, please include things such as name, call, marital status, harmonics, years licensed, awards, civic accomplishments, service record, type of work, club affiliations, special interests (ham and other), and your reasons for nominating this amateur.

Send to Dave Grubb, Asst. Chairman, Dayton Hamvention, PO Box 964, Dayton OH 45401.

Never Say Die

Continued from p. 4

make an effort to make ham contacts more interesting. You can help with your newsletter by coordinating special interest groups on your local repeater. Tuesdays at 7 p.m. we talk UFOs. Thursdays at 9 p.m. we talk travel. Fridays at 6:30 we talk music and records. If your club is within radio distance of me, you'll get me!

What else? Photography? Model airplanes? Scouting? Macintoshes? Books? Diving? Have you asked your fellow club members what their interests are?

My wife Sherry bought a Mac and is having a ball with it, as I've mentioned. She puts out a special interest Mensa newsletter, does all the artwork for her how-to-dance video packages, her news releases, and so on. She's even got a portable Mac so she can keep right on working when we're on trips.

Jim Morrissett K6MH/1 has his own Mac. Rob Burr, a diving buddy of mine, uses his Mac to publish *Fisheye View* magazine. He also sells a CD-ROM with a whopping pile of Mac software on it, in case you get a ROM drive.

When you're not using your Mac for publishing and making your million, it's not bad for hamming too. It'll even run a wicked bulletin board for you.

Let's see, I've explained how you can help make your club grow. . . how you can help get youngsters into amateur radio. . . and that if you have an entrepreneurial bent, but don't have the ideas, I have some available. 'Nuff of that.

License Fees

One of the ham publications took a swipe at me. . . boy, is that news! The charge was that I stood by idly while Congress was trying to put amateur radio out of business by charging for ham tickets. Why didn't I get on the first plane and zip down to D.C. and put my finger in the dike?

I'm guilty. . . with an explanation. That's an explanation, not a rationalization, by the way. I didn't mount a Wayne Green congressional offensive for one damned good reason. . . I think the proposed license fee would have been one of the best things Congress could have done for us. I honestly believe the ARRL panicked and reacted to this without bothering to think through the results of their actions. One or two of us still remember their Incentive Licensing disaster. . . the worst catastrophe in the history of amateur radio. . . which resulted from their shortsightedness and greed 25 years ago. Oh, some bubble-heads have been wringing their hands about the license fees in print in anguish. . . which they do, no matter what happens or almost happens. The Chicken Little reaction. Phooey.

Now why on earth would I think that a $30 license fee for a ham ticket is a good thing? Why would I dare to claim that scotching this fee is another big nail in our ham casket?

Yes, I know all about the fee going into the general fund and not to the FCC. Well, not directly, of course. Congress has too many constituents with large pocketbooks who need FCC favors for them to let the FCC get any money that Congress doesn't get first and then dole out. Money is power. This is not a new concept, it's one which we're seeing played out daily in congress.

Well, those $30 fees are money. . . right? And four hundred thousand of those are a few million dollars. Money. You know, that stuff that talks. Oh, it isn't much compared to the deficit, the military budget or guaranteed bum S & L bank loans, but it's still money and it still talks. And isn't that what we've been complaining about so much recently. . . not being heard?

We've been raising a big stink because UPS money talked louder than ours. Ours? What ours? If we had any leadership we'd be raising hell over losing most of the 902 MHz band. Yes, I know we're not using it, so who cares. . . well, not only aren't we using it, it seems doubtful if we'll ever get much use from it now. I notice this has all happened with no hysteria. . . no complaints. Tsk.

Look, even though the FCC has us doing our own license examining, they still have some expenses for us. Someone has to pay Johnny Johnston's salary and overhead. Between that, the ARRL suing them over things and our endless demands for rule changes, we're costing 'em far more than a crummy $30 apiece. By the way, that's $30 for a ten-year license. That comes to a piddling $3 a year. Now, if your ham ticket isn't worth $3 a year, you're not using it.

As a registered Washington lobbyist for over 25 years, I do fly down to D.C. when I think it's going to help. One of the reasons we

QRP *Continued from page 68*

tance than 40 meters. The link itself is only 3 turns of insulated hookup wire wound over the tank windings. You can use a small link connected to a low voltage bulb as a tune-up aid. Tune for the brightest glow. You'll have to play with the number of turns to find resonance.

Again, you can build this transmitter during a rainstorm on a Sunday afternoon, so don't be put off something as simple as this. Why, you might even learn a thing or two about tubes!

Rajendra Kumar VU2ZAP sent me the circuit for this project. Rajendra reports excellent results with the 5 watts into a dipole. The original circuit came from W1HYF from 1948. An oldie but goodie, as they say on the radio. Rajendra is

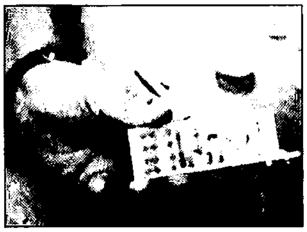


Photo C. Close-up of a one-watt transmitter board being stuffed, to give you a good idea of the size.

QRV on 18 meters and tells me he has no trouble hearing 5 watt stations from the states, especially the fantastic chaps and the excellent chats, other than the 59 and 73 you get on the other bands. Rajendra supplied the photographs.

QRP Transmitter Circuit from WD8OYG

Returning to the year 1990, Dwayne Kincaid WD8OYG sent me some photographs of a small QRP transmitter he put together for a Novice class. Dwayne reports excellent results from the guys and gals completing the project. I don't have room here to show the circuit, but if you would like a copy, write to Dwayne at SR 1, Box 2C, St. Leonard MD 20685. I can tell you the circuit is simple and quite easy to reproduce, even for those who never plugged in a soldering iron before.

Of course, it is crystal-controlled. There are four places on the board for crystals. You select which one you want with a switch. Simple, basic, and to the point. Besides, what have you or your club done to encourage new hams into our hobby? Dwayne is making the right moves. New hams and QRP, what could be better? 73

Hamsats *Continued from page 9*

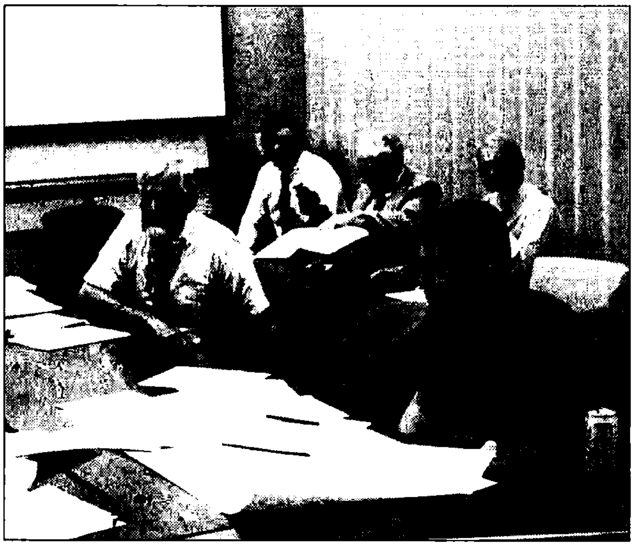


Photo B. Astronaut Ken Cameron KA5AWP (foreground) and others at the SAREX II planning meeting.

ments. Items to listen for include payload descriptions, astronaut profiles, Keplerian orbital data, shuttle rise and set times and, for STS-35 and 37, SAREX-specific information. The SAREX data will take in operating frequencies, operation procedures, activity schedules and other newsworthy items. The WA3NAN transmissions will be around the clock beginning one hour prior to launch and continuing through shuttle landing. 73

are doing our own licenses now is my visits with the commissioners. I helped get the strangling repeater regulations repealed. I've found my visits to Washington, both to Congress and the FCC, to be well received because I always come with proposals on how they can save money instead of plans for my taking some back. . . which almost all other visitors have.

For a measly $3 a year license fee we'd have one heck of a card to play with Congress when we actually do need help. This might also shake out some of the dead-above-the-shoulders hams when it comes to renewal time and make us all a whole lot more aware of how few active hams we really have today. . . and how pathetically few new hams we're attracting. It would put our hand in the fire and wake up some old hams who tune in a pileup on 20m and think every ham band must be crowded.

No, our $30 won't solve the deficit, but it will make life easier for the FCC because they'll be able to point out to Congress that their expenses on our behalf are being reimbursed, so let's not be so fast to take all those UHF bands away.

Will a $30 fee keep a youngster out of the hobby? I know that it's stupid to even bring up such a ridiculous idea, but I've actually seen this dumb thing in print. We're talking the price of a dinner now. We're talking the cost of a family of three going to the movies. . . complete with the usual barrel of buttered popcorn and 55-gallon drum of Coke. Give me a break! Hamming isn't a hobby which is going to get kids out of the ghettos, it's a middle class hobby and $30 isn't a problem for 'em.

Let me put that into perspective for you. Most of you are my age, so $30 today is about like $1.50 when we were young. Three quarts of ice cream. Ten ice cream sundaes, the big ones. Well, Eisenhower said the government would take our dollars in Social Security taxes and pay us back in dollarettes. He wasn't lying. . . that time.

So those who are preening around, taking credit for defeating the license fees are, in my mind, traitors. I think they've pulled a shortsighted grandstanding stunt which could haunt us for years. They deserve a pie in the face, not a medal.

Yes, I know, many hams feel that, gee, we're providing emergency communications, so we should be paid by the government for this. We're not doing this emergency work to be good citizens, we're doing it to pay for our use of several billion dollars worth of ham bands. They *owe* us those bands and have no right to take them away. We're already paying for them, so charging us a fee is unfair. What hogwash.

Fortunately I don't feel very strongly about this, so I won't try to stir up anyone about it. I'm positively not going to pillory the ARRL over this one. No, I have another one for that. Heh, heh. No, if you want to help sink our hobby, you just go right ahead and insist on getting the FCC to do everything for us for free. You go right on griping to them about the rotten service they're giving. Let 'em know how angry you are over the lousy operating, jamming and bad language on our bands and how they damned well ought to do something about it because we're too busy to do it ourselves, even though we told them we're a self-policing "service." Explain that that was just a little . . . ahem. . . exaggeration.

I wasn't going to bring all this muck up, but someone else got out the rake and banged me with it. I thought I'd better explain why good old Doc Green didn't rush to Washington in the middle of a congressional recess and make a stink. I prefer to keep my dealings with the FCC (and Congress) in a positive vein and not waste any IOUs on fights.

If we come up with positive plans for helping amateur radio grow and for making it provide more value to our country in exchange for the use of tens of billions of dollars in frequencies, we'll get almost anything we want. But when we don't talk with the commissioners except to fight them. . . and then take them to court when we don't like what they've done. . . that seems like an incredibly dumb way to treat the hand that's feeding you.

It was in order to counter this historic ARRL approach, that I formed the National Industry Advisory Committee. It's supported (very feebly) by the ham industry. Bush has finally appointed the last new Commissioner, so perhaps we'll have a full set we can talk with (advise) by spring.

Typical Ham Club?

As best I can, I get around and address ham clubs and hamfests. On one weekend I zipped down to

Texas on a Saturday morning, starting out from home around 6 a.m. to catch a 9 a.m. flight. I got to the hamfest by 1 p.m., spoke from 2–4 p.m., visited with the exhibitors for an hour, rested up and hit the banquet at 6. One of the better banquets, by the way. Then an hour talk as the banquet speaker.

In these talks I tried to put the last 30 years of ham history in perspective. Naturally some questions about the code came up. I was pleased to find about 95% of my audience open to actually consider the subject and amused by the two wizened old timers who weren't.

A few days later I was addressing a ham club near Boston. The first thing I noticed was that I was one of the youngest hams there. I can't imagine a young ham staying at their meeting for more than two minutes. As I looked out over this room full of kvetching antiques, it came to me how they typified the code itself.

Most of the hams I run into on the air these days are retired. Sadly, few of them seem to be doing anything useful in their retirement. Hamming, golf, puttering around. What a waste, it seems to me, of a lifetime of experience. Think of all the hard won skills which are being thrown away. What a loss to the world, our country, our communities—even their families.

As hams we have the key right there in our hands . . . and I don't mean a Morse key. The key is technology, with all its promise. The key to the power to change the world. How sad to see the key to knowledge—to progress—to success—hanging from a call letter keyring, its real use long forgotten.

Electronics is the real power behind the Japanese success story, the engine driving their whole country. As hams, presumably we have the ability to learn, but something's gone wrong. We don't seem to have the interest. What happened?

I'd love to *run* a series of technical articles in *73* to help make today's communications technology more easily understood. But the reader feedback tells me that *73* is already too complicated at times. Too technical! That's pretty depressing, considering how lightweight the *73* technical articles have been.

I keep running into the "Oh, I'm too old to learn anymore" syndrome. That's ridiculous, unless you've got Alzheimer's or something.

Every time a new technology opens up, with it comes all kinds of opportunities to start small businesses supplying hardware, software, information products and services—entrepreneurial opportunities for people of any age. Just look at the number of new ham firms making packet gear today!

Or take the compact disc, which has revolutionized the music and audio businesses. Hundreds of small entrepreneurial firms with interesting new products have sprung up all around the country. New speakers, amplifiers, all kinds of cables, connectors . . . it's endless. Now, with the cost of producing compact discs dirt cheap, we're seeing hundreds of new record labels producing specialized music. Entrepreneurs are having a heyday, just as they did when the microcomputer came along 15 years ago, generating thousands of new millionaires.

Electronics is a key to the future, if you use it. The human mind has an unlimited capacity for learning, but like most other things, if you don't use it you'll lose it. The more you learn, the better your mind will work. When is the last time you truly exercised your mind?

It's depressing to me when I ask for a show of hands at my talks. How many of you are into DXing? In a room with perhaps 300 hams I'll see two or three hands go up. How many of you have over 300 countries confirmed? No hands. How many of you have been on a DXpedition? No hands at all. How many have done anything on a microwave band—something above 500 MHz? No hands. How many of you have made any contacts via Oscar? No hands. How many are on packet? Several hands. That's better. How about RTTY? Nothing. Now I'm getting sullen, furtive looks. Okay, let's talk code now. How many here believe we should maintain the code requirement for a ham license? Lotsa hands. Okay, how many of you can copy code at 35 wpm? One hand. How many of you have made a hand key contact in the last month? One hand.

Well, how about contests? How many here have won a contest for your section? One hand. Hmmm, not so good. How many have had an article published in a ham magazine? No hands. How many have built something in the last year? Two hands. Heathkits.

Now, please tell me, with that

frenzy of activity by today's hams, how on earth are we going to interest youngsters in our hobby? Kids want action. I'm not even seeing talk, much less action. What's happened to us? What do I have to do to get a spark of excitement into your hobby? How can I get you to give OSCAR a try? Get you to even give packet radio a try? Get you off your duff and onto a Caribbean island for a DXpeditionette? Get you to put up a new beam and really talk with 100 countries? How about getting set up to win a contest? Or setting up a work bench, getting some test equipment and building some kits? There are plenty of interesting *things* to build *from* Heath, Ramsey and so on. And I've got a bunch more coming up in *73*. The food is there on the table and most hams are starving to death.

If you got even slightly irritated over the loss of 40% of our 220 band, can I get you interested in doing something which might help stave off further such losses? We have the potential to do just about anything we really want to. The power is there, waiting to be used, and we're refusing to bother to reach for the switch.

Until we come to life—until we get excited about technology and demand to learn—until we get busy bringing amateur radio out of the '50s and into the '90s—until we take the power amateur radio has to attract youngsters and get them into high tech careers, giving our country the ability to again oompete in technology with Japan and Europe, we're going to keep going downhill.

So, when I talk with you on 20m, talk to me about what you've built recently. When I see you at hamfests and conventions tell me about the DX you've actually talked with. Tell me about how many countries you've managed on 80m; how many via OSCAR. Tell me you've been on 10 GHz and have been having a ball. Show me your contest award certificates.

When I run into you on your local repeater, talk to me about your interests. Are you into cosmology? You'll find me fascinated. How about fibre optics? Color SSTV? High data throughput with narrow-band techniques? Talk to me about UFO detection and I'll tell you why you're going to fail. How about solar flare detection? Sun spots? Have you got a telescope so you can check out sun spots? COMB is almost giving 'em away!

If I come to a hamfest in your area to talk, I want to be addressing a ham rally, not a wake, so let's start doing some ham work. I want to see the hands go shooting up when I ask if you're on packet or RTTY. I want to see the 10 GHz rigs you've built. The darned things are small, inexpensive and a ball to use. I want to see your DX Dynasty Award certificates. Show me your 100 country QSL collection for 80m. Show me your cards for 160m. Show me your 6m states. The bands are coming to life and we're heading into the best sun spot cycle in history. So let's forget Monday night football and those Sunday ball games. You'll do better to get some sleep so you can work DX all night. Or start a business so you can afford to go on some DXpeditions—can afford to buy a new rig—that new tower and nice big beam—can even afford a house where you can put up antennas.

I'm living on a southern New Hampshire hilltop. The nearest neighbor is over a half mile away. I've got ducks, geese, chickens, turkeys, cats, and dogs running around the place. The local ski area is right out my window. My skis are by the door, ready when the snow conditions are right.

How come, when I'm not yet retired, I'm keeping up with technology. . . in radio, in computers, in audio? In addition to 19 current publications, I've got a bunch more I want to start. . . as soon as I'm able to find the right people to help me with them. I know a dozen new magazines which are desperately needed. There are some fascinating new mail order businesses which should go gangbusters. There are so many businesses which can be started for peanuts and get into the million-dollar range quickly that I just can't understand how so many hams can work for years building expertise and skills—and then just stop, turning into veritable vegetables. What a waste of a mind. Or, as our beloved VP said, "What a waste it is to lose one's mind, or not to have a mind. . . how true that is." I couldn't possibly fail to disagree with him less!

Please tell me, what would it take to get you on packet? Presuming that you have a rig for some band, you'll need a computer, a converter and a spirit of adventure. . . the courage to actually try something new and perhaps, at least for a while, make a fool of yourself while you're learning.

Do you need more articles on it?

Over 90% of you haven't tried packet yet. What's it take? Let me know so I can do it.

If you're a packeteer, make it your business to get around to every club you can reach and show those old fogies how easy it is. . .and how much fun they've been missing. Keep it real simple.

If you've never been into DXing, contests, packet, RTTY, SSTV, UHF, home construction or otherwise developing your ham horizons, perhaps it's time to sit down and do some serious thinking. Get out some paper and explain to yourself why, with a feast available to you, you're going through life eating well-done hamburgers and fries?

Yes, I know you can get by with a 2m rig and endless, meaningless chatter over your local repeaters. That's about all a Tech ticket has to offer those with no sense of adventure. . . those dead of soul. And yes, Generals can spend their declining years joshing friends on a 75m net. I've done those too, but that hasn't stopped me from enjoying the excitement amateur radio has to offer. . . the adventure.

Getting on RTTY does take gumption. It means changing your routine. . .getting out of your rut. It'll also keep your heart pacer busy because you'll find a whole different breed of ham there. . .others with adventure in their souls. You'll find people who are interesting and different. . .people who have had the guts to explore.

A couple generations ago the adventurous had new parts of the world to explore. My mother met Osa Johnson on her honeymoon in northern Vermont. . .I think it was about 1920. Osa, who was 16, had just married Martin Johnson, the explorer. I watched some old Osa and Martin movies on TV the other evening as they went places no white people had been before.

There are still some marvelous places to visit in the world, but you'll find Hyatt hotels or Holiday Inns there now. They're fun to visit anyway. But no more fun than exploring the new worlds amateur radio has out there for you. I've been to many exotic places around the world. . .and I've done about everything there is to do in amateur radio, so I can promise you that we have adventure waiting for you. . . excitement.

There's nothing wrong with mixing hamming and exploring. You can do it on 10 GHz from mountain tops or DXpeditioning from Mbanbane or Meseru. And yes, I've done those too. I've been there. . .the water's fine. . .come on in.

When I visited St. Pierre on a weekend DXpeditionette in 1988 I had so much fun that I convinced myself that there really must be some way to get other hams to go up there and share the feeling. It's easy to get to, ridiculously inexpensive, and the world of amateur radio is your oyster. You're DX! There are very few hams who couldn't take the time and afford to go to St. Pierre and be DX. Yet, when I wrote about it in *73* and asked if anyone was interested, I didn't get a single letter.

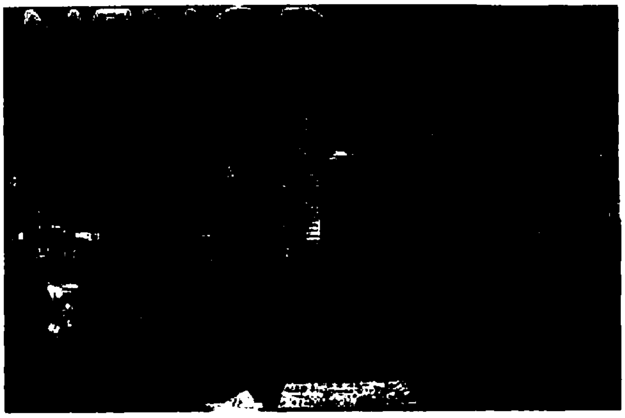
I had visions of sending a nice little permanent ham station up there and setting it up in the hotel so hams could fly up and see what it's like to work several thousand eager DXers in a few days. I even found a local ham who volunteered to help keep the station in top shape. Alas, no takers. Not one American ham with enough gumption to make even that easy trip.

If I could get you moving I'd love to set up stations in a lot of interesting and accessible places so you could vacation, ham and perhaps get in some great diving. . .unless that's too exciting for you.

Write to me. Tell me what is holding you back. Why can't I get you to St. Pierre? Why can't I get you on OSCAR? Why aren't you on packet yet? Why haven't I worked you from 9M6 or 9M8. . . or even 9N1? You've worked me from those spots. . .and YA, YK, JY and so on. What's it take? Is there something I can do in *73* which will get you off dead center? Or am I eventually going to see you listed in Silent Keys as your major contribution to amateur radio?

Can I get you to try one new ham adventure? Can I get you to take a youngster under your wing and get him (or even her) enthused enough to get a license? If not, get out some paper and tell me why. I guarantee I'll read it. I may not have time to answer . . .and if I print your letter I'll withhold your name and call if you prefer.

If you're one of the few who can hold up a hand when I ask about ham adventurers, how about communicating your excitement to your fellow club members? Get 'em involved. Invite 'em over to your shack and show 'em how



QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock NH 03449. Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

much fun you're having. Show 'em how easy it is once you get started.

Heck, when I got started with NBFM I had to build my own gear. I still have a couple of my old RTTY panels around. They're monsters compared to today's stuff. 19" x 24" panels packed with tubes. I even had to make my own tuned chokes for the filters.

Other than kits, yes it's very difficult to build ham gear these days. It's the parts. Now that virtually no parts are made in America and most of the parts houses have blown away, unless you go to a hamfest flea market you aren't going to find parts. So buy kits. Let entrepreneurs find the parts and bundle them for you.

By the way, I'll be at Dayton again this year, and I'll be out for the Minneapolis convention. I want to hear some adventure stories from you—of business, hamming, getting newcomers. I also want to hear that you've stopped smoking, given up beer and have slimmed down. With so few new hams to subscribe to *73*, I need all you old timers to live long, healthy lives. Now, where'd I put those darned ski boots?

Y'all write . . . y'hear? ■

Dual-Band

Continued from p. 48

Tuning Procedure

For tuning you'll need a low level signal source of approximately five watts, such as a Bird wattmeter with an appropriate full-scale plug-in element or other SWR indicating instrument. Set up the antenna to the dimensions given. If your material is of the same diameter, the only adjustments would be for the capacity settings.

First, mount the antenna in place because there will be capacities from the vehicle itself. If you don't mount it, then clamp it to a wooden ladder located at least 10 feet from any surrounding structures. Start with the higher frequency element (the upper unit). With the SWR bridge in place, feed the appropriate signal. Note the incident or forward power level. Reverse the wattmeter element or switch position for a reflected power indication; adjust the capacitor for a minimum reflected energy indication.

Move yourself out of the RF field and note the reading. Touch up for minimum reflected indication. If not near unity, move the support bar in either direction to reduce the readings. Move the quarter-wavelength section in either direction to further reduce the indication. Conclude the adjustment by tuning the capacitor. Repeat the above procedure on the lower frequency unit. If you tune the lower frequency first it won't be necessary to repeat the procedure on the higher frequency.

I used glass piston capacitors to tune out any inductive reactance. After the unit had been tuned, I sealed the ends with plumber's white silicone sealant. An alternative to this is to measure the resultant capacity of the tuning capacitor and substitute fixed value capacitors.

I would be most interested in hearing from you if you put together this duo-bander. I respond to all letters that include an SASE. ■

Contact Robert E. Bloom W6YUY at 8622 Rubio Avenue, Sepulveda CA 91343.

ASK KABOOM

The Tech Answer Man

Michael Geier KB1UM
PO Box 64766
S. Burlington VT 05406

PLL, VCO and Other Dirty Words

Before we get into this month's topic, let me thank all who have written regarding Flavorig (see the November 1989 issue of *73*). The response has been enthusiastic and most rewarding. A few of you have asked me for layout diagrams for the transmitter board. I'd be glad to oblige if I could, but the simple truth is that I laid it out as I went along, and it has no particular organization. The layout isn't critical at these frequencies, so feel free to experiment. A construction project like this isn't a kit, so just do it your own way and see what happens! Who knows, yours may be better than mine. In fact, one fellow has written saying he has a design for a simple sideband filter for the rig. I'll let you know more as soon as I find out myself.

One thing that apparently wasn't clear from the photos is that the rig does not fit into the original case. Only the front was used; the sides are extended back a ways with perfboard, and the back is new, too. If you want to, you can build the rig into any project box and discard the radio cabinet altogether.

A Piece of the "Rock"

If you've got a walkie or HF rig less than five years old, it's almost certainly "synthesized." It has a digital display, and frequency drift is close to nonexistent. Perhaps it has memories, multiple VFOs, and/or some of the other modern bells and whistles. But just what is a frequency synthesizer? What does it do and how does it do it? How is it different from an analog VFO? And what can you do when it won't work?

The basic purpose of a frequency synthesizer is to generate oscillator frequencies which are as stable as if they were crystal controlled, but without the single-frequency limitation inherent with crystals. In other words, rock stable but not rock bound! Further, the "tuning" should be completely repeatable, permitting functions like scanning and memory.

We think of synthesizers as being digital, but in reality they are part digital and part analog. The actual voltage controlled oscillator (VCO) that generates the frequencies is not much different from a good old analog VFO. It typically has a coil-capacitor (LC) tank circuit for tuning. The difference is that the capacitor is a varactor diode, instead of a variable tuning cap with a knob. The diode is a special type which acts like a variable cap. Its capacitance changes depending upon the amount of DC voltage applied to it. Thus, the oscillator's frequency can be controlled from another circuit.

That other circuit is, of course, the digital part, with the microprocessor and its associated components. It controls the oscillator so that the radio will operate on the frequency shown on the display, which is also generated by the same micro. When you "tune" the rig, whether by knob or keypad, you are really just entering data into the micro. It then interprets your input and sets the display and the synthesizer frequency to match.

Let's Get Loopy

So, the micro generates a voltage which controls the VCO, and the rig is on frequency, right? Sorry, it's not that simple. Sending a DC voltage to the VCO should, in theory, set it on the desired frequency, but it just doesn't work. Real-world influences, especially temperature, cause the exact frequency of the VCO to be somewhat unpredictable. Right now, 7 volts might set it to 5.3 MHz, but later it may drift (like any oscillator) to 5.4 MHz. There goes the stability, which was supposed to be the point in the first place!

The only way to ensure the stability of any variable system, whether electronic, biological, or otherwise, is to compare its performance to a stable reference. Your body maintains a position reference in your inner ears, in the form of organs containing a fluid which is held down by gravity. As you move, the fluid shifts, telling your brain where you are. Damage those organs, and you could not stand up. Similarly, your watch keeps time only because it has a crystal reference with which to define the second. Change the reference speed and the timekeeping accuracy will go off the deep end.

The whole essence of frequency synthesis is contained in what is known as a phase-locked loop (PLL). It's a fancy term for feedback. The VCO frequency is fed back and compared to a fixed crystal reference to determine whether or not it (the VCO) is on frequency. If not, its tuning voltage is altered until it is. Sounds simple, right?

It is, except for one problem. How do you compare the VCO and the crystal when they are not on the same frequency? Obviously, if they were, then you could just use the crystal and forget about the VCO altogether! In fact, the VCO must cover a whole range of frequencies, so that you can tune around the band.

The solution is a programmable frequency divider which can alter the VCO frequency to match the crystal reference and permit the two to be compared. Let's say the desired VCO frequency is 5.0 MHz. The crystal frequency is 1 MHz. If we divide the VCO 5 times, then we can compare it to the crystal. If we then adjust the tuning voltage until the two exactly match, the VCO will be at exactly 5 MHz.

And this scheme works. It is limited, however, by the fact that we cannot divide by fractional numbers. If we want 5.3 MHz, for instance, we have no way to divide by 5.3 to do the comparison. So a simple synthesizer of this kind could not tune in increments of less than 1 MHz, which is (not coincidentally) the reference crystal frequency. So how, then, does an HF rig tune in 10 Hz increments? With a 10 Hz crystal??

Go Up, Young Man

Of course not. There is no such thing. The needed resolution can be obtained in various ways, one of which is to do everything at a very high frequency, and then divide the results. The required frequencies can get rather extreme (and the reduction of the tuning step is accompanied by a corresponding reduction in overall frequency range), so other schemes involving multiple loops and mixers have evolved and are used quite successfully in today's rigs.

In some designs, one loop's output can serve as the reference frequency for another loop, generating higher resolution because of the many possible combinations of the loops' division ratios. In others, independent loops are used to generate the coarse and fine frequency steps, with their outputs mixed together later on. In any event, virtually all synthesizers used for HF involve multiple loops, usually driven by (and therefore referenced to) one master crystal oscillator.

VHF synthesizers are actually much simpler than those used for HF, because the required resolution is much less. Two meter walkies, for instance, need a minimum step of 5 kHz, which is a great deal easier to achieve than 10 Hz!

Look Ma, No Hands

The greatest advantage of a PLL over an analog VFO is stability, but is the loop really stable? Over the long term, it's as stable as the reference crystal from which it's all derived. In the short term, though, it may be another story. Remember I mentioned that the VCO frequency is constantly being compared to the reference, and any errors are corrected through changes in the DC tuning voltage applied to the VCO. Well, there are always some errors and always some changes in that DC voltage.

In other words, the VCO is ALWAYS wandering around a little bit. It is possible to make the error correction very fast, but it can overshoot and cause instability if pushed too far. So, some amount of wobbling must be tolerated. This wobbling is called phase noise. It amounts to a random FMing of the VCO, and causes various problems, from hissy TX and RX to reception of signals outside the normal receiver bandwidth.

Reduction of phase noise has been a major goal since synthesizers were introduced, and today's rigs are better than those of just two or three years ago. Of course, even analog VFOs have some phase noise, as no oscillator is perfect. But they are still quieter than synthesizers, although the digital stuff is catching up.

Next month, we'll discuss the troubleshooting of synthesizers. But right now, let's look at a letter that is especially appropriate to our current topic:

Dear Kaboom,

My Kenwood TS-440S/AT makes a "popping" sound every 10 kHz when there is an AM carrier on frequency. Kenwood says it is normal, but I've asked around, and some rigs have the problem and others don't. Can you help?

Signed,
Poppin'

Dear Poppin'

Funny you should ask. Actually, I've discussed this problem before, but it bears repeating. Your rig, like most newer ones, has had its PLL loop filters "tightened up," or made faster, to help reduce phase noise in the synthesizer. The result is a quieter, cleaner-sounding receiver, but also some overshoot (momentary instability) at certain frequency points, such as 10 kHz. That's what causes the pop. The older rigs which don't pop also have more phase noise. You gain some, you lose some. By the way, my '940 does it too, and it annoys me also. ■

Number 34 on your Feedback card

. . . de K6MH

The 3 Cons

I'm thinking of 3 "con" words, and how they relate to ham radio: Context, Contest, and Content.

First, Context. What is the Context of amateur radio? I think you could say it is to see if we can communicate across a distance. And we've shown, to the amazement of all, that we can do it in ways and on frequencies earlier thought impossible.

In exploring this context, we have tried competition. Discovering we could get through on high frequency bands, we engaged in contests to see who could do it better and faster.

Then we got into repeaters. Contests increased activity temporarily. But repeaters made clear channel FM available to all the HTs in town and to autos all over, 24 hours a day. 2m FM became one of the hottest things in ham radio.

Which brings us to the third con: Content. Now that we have set the context, communication across a distance, and honed our abilities thru contests, what are we to do now that we have clear channels? Well, we could always get on and say "um-err" a couple of times, and go back to HF and contests, getting our satisfaction out of this atavistic struggle to "get through."

You don't hear many contests on repeaters, do you? Because there, the contest is over. We've won. Now we can ask ourselves, why did we want to communicate in the first place? Because the point is, we have arrived. With repeaters we can communicate, loud and clear, all over the place. So what was it we wanted to say? Just: "Hello, where are you, what's your name, what's it like there, what are you using to talk on?"

Here we are now with the first stages of a technology that will transmit accurately almost any amount of content. What do we want to do with it? We're not supposed to broadcast, although we can talk to a network of other hams or even call QST to all radio amateurs (I don't think the League has a corner on that). We are not supposed to transmit music, though some hams are already talking about exchanging digital signals that could translate as music. We can send pictures, moving or still. We are not supposed to do anything commercial. OK. So what can we do? Education? Town meetings on the air? Special interest groups? Have any hams visited the halls of Congress and QST'd the workings of government or their observations on it to fellow hams? You thought we couldn't do that? What can we do that we haven't tried? How many hams get together to share poems, or dreams, or things they might be writing, reading, building, thinking about? How many of us can get beyond "What will they think?" and into what WE think?. . . right there, on the air, live, unrehearsed. I'm not talking about opinions. I'm talking about doing our very best thinking out loud, first crack out of the box, no holds barred, right there on the radio. Can we?

Funny. Thinking of Context, Contest, and Content. I guess you could say that Context is the function of ARRL. They have been around since the beginning of ham radio. *CQ*? Heavy into Contestmanship. *73*? A rallying place for hams concerned with the Content of amateur communications. I hesitate to call this Contentsmanship.

"Content" is part of the word "contentment." Apropo. If QSOs have content, one tends to feel contented. Discontent? That too-occasional feeling of burnout after a couple of hours on the air indulging in the ham equivalent of cocktail conversation.

Amateurity

In the December 1989 *73* I mentioned the word amateurity, the impulse of well-integrated, mature humans to do what they do for its own value, rather than being controlled by a ring in the nose called "reward," "punishment," or "compensation." I got a letter from O. J. Lougheed N5JXU at High Desert Research Farm, Abiquiu, New Mexico, whose efforts are toward sustainable agriculture and people-to-people communication worldwide. Included was a great story from the magazine *Home Power #5*, titled "So what can ONE person do, anyway?" It's about a lady in her 70s, a retired English teacher living on a sailboat in Santa Cruz, CA.

Mary Duffield teaches ham radio and social responsibility to young people along with sailing and energy self-sufficiency. One example: Mary's ham kids set up an international teleconference via ham radio to investigate water quality. Students of Junior HS age or less in US, Scotland, West Germany, Canada, Denmark, and Japan participated. Water test kits were sent out to all participants, who agreed to cooperate in cleaning up the worst one, a school in upstate New York whose water was badly contaminated with lead and PCBs. . . and it got done, by citizens too young to vote. 73

Number 35 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
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Payson AZ 85541

The Best and the Worst

While the month of March marks the vernal equinox, and probably the best DX conditions of the entire year, it is also likely to be the most troubled month in terms of geophysical upsets. As we close in on the maximum sunspot number—possibly late this year—and the greatest solar activity in many years, the chances are greatest for the best of conditions and the worst of conditions.

You can expect the greatest disturbances in the earth's magnetic field, with possible storm levels on many days, during the first and last full weeks of the month. You can also expect associated weather phenomena and other geophysical effects around the world.

Best DX in Years

On the brighter side, you can count on 6 meters being open much of every day, ten meters being open until long after dark, and so forth down the spectrum.

Spring brings thunderstorms in some parts of the country, and snow in others, with consequent atmospheric static. However, in spite of the problems occurring for at least 14 of the 31 days you will no doubt consider this month to be the best for DX you've seen in the last ten years. Enjoy!

Use the band-time-country chart for planning your forays into the DX jungle, and watch the daily chart for expected conditions. WWV at 14 minutes past each hour will also give you a summary of past, present, and future expected conditions. If the forecast disturbances vary from the predicted days by a day or so, don't be surprised, because forecasting in these times is more an art than a science, and Old Sol loves his little surprises. 73

EASTERN UNITED STATES TO:

GMT.	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	—	20	—	—	—	20	20	—	—	15	10/15
ARGENTINA	15	15/20	20	40	40	—	—	10	—	—	10/15	10/15
AUSTRALIA	10/15	20	20	20	20	40	20/40	20	—	—	—	10/15
CANAL ZONE	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
ENGLAND	20	40	40/80	40/80	40	—	—	15	10	15	15	20
HAWAII	10/15	15	20	20	20/40	20/40	20	20	—	—	—	10/15
INDIA	20	20	—	—	—	—	—	15	—	—	—	—
JAPAN	10	—	20	—	—	—	20	20	—	—	15	10/15
MEXICO	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
PHILIPPINES	15	—	20	20	—	—	20	10/15	10	—	—	15
PUERTO RICO	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
SOUTH AFRICA	20/40	40	20	20	—	—	—	—	10	10	15	15
U.S.S.R.	40	40/80	20	20	—	—	—	10/15	10/15	—	20	20
WEST COAST	20/40	20/40	20/40	40	40	—	—	10/15	10/15	10/15	10/15	20

CENTRAL UNITED STATES TO:

GMT.	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10/15	15	20	20	20	—	20	20	—	—	—	10/15
ARGENTINA	15	15	20/40	20/40	20	—	—	10	—	—	10	10/15
AUSTRALIA	10/15	15	15	—	20	20/40	40	20	—	—	15	10
CANAL ZONE	15/20	15/20	20/40	20/40	20/40	—	—	10/20	10/20	10	10	10
ENGLAND	40	40/80	40	—	—	—	—	—	15	15	20	20
HAWAII	15	15	15	20	20	20/40	40	20	—	10	10	10
INDIA	15	15/20	—	—	—	—	—	15/20	15	—	—	—
JAPAN	10/15	15	20	20	20	—	20	20	—	—	—	10/15
MEXICO	15/20	15/20	20/40	20/40	20/40	—	—	10/20	10/20	10	10	10
PHILIPPINES	10/15	—	20	20	—	—	—	—	10/15	10/15	—	—
PUERTO RICO	15/20	15/20	20/40	20/40	20/40	—	—	10/20	10/20	10	10	10
SOUTH AFRICA	—	—	20	20	—	—	—	—	15	15	15/20	20
U.S.S.R.	—	—	—	—	—	—	—	15	15	15	20	20

WESTERN UNITED STATES TO:

GMT.	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10/15	10/15	15	20	20	20	—	20	20	—	—	15
ARGENTINA	10/15	15	15	20	20	—	—	—	—	—	10	10
AUSTRALIA	10	10/15	15	15	20	20	20	—	20	—	—	—
CANAL ZONE	10	15	15/40	20/40	20/40	—	—	—	10	10	10	10
ENGLAND	20	20	—	—	—	—	—	—	15	15	15/20	20
HAWAII	10/15	10/15	15	15/20	20/40	20/40	40	—	15	10	—	—
INDIA	—	15	20	—	—	—	—	—	15/20	15	—	—
JAPAN	10/15	10/15	15	20	20	20	—	—	20	—	—	15
MEXICO	10	15	15/40	20/40	20/40	(2)	—	—	10	10	10	10
PHILIPPINES	10	10	—	—	—	—	—	20	15	15/20	—	—
PUERTO RICO	10	15	15/40	20/40	20/40	(2)	—	—	10	10	10	10
SOUTH AFRICA	20	20	—	20	—	—	—	—	—	10	15	15
U.S.S.R	20	—	—	—	20	—	—	20	20	20	20	20
EAST COAST	20/40	20/40	20/40	40	40	—	—	10/15	10/15	10/15	10/15	20

* Try next higher band on "G" days (1) Possible opening on this band on "G" days (2) Try 80m
Note A: Use values of 10/15 for 12m, 20 for 17m, 40 for 30m Note B: This chart refers to the highest band possible at the time indicated. * no luck, try next lower band

MARCH 1990

SUN	MON	TUE	WED	THU	FRI	SAT
				1 F	2 F	3 F-P
4 P	5 P	6 P	7 P	8 P	9 P	10 P-F
11 F-G	12 G	13 G	14 G	15 G	16 G	17 G
18 G-F	19 F	20 F	21 F	22 F-G	23 G	24 G-F
25 F-P	26 P	27 P	28 P	29 P	30 P	31 P

73 AMATEUR RADIO

International Edition

A WGE Publication

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Number 1 on your Feedback card

LETTERS

From the Hamshack

Electric Blanket Mod Supply

After reading your column about the 60 hertz radiation, I was concerned. I also enjoy sleeping under an electric blanket. I didn't unplug my blanket, though. Instead, I built a DC power supply to power It.

I run the AC line through the existing thermostat, then through 17 ohms of 50 watt power resistors, then to a 600 PIV, 4 amp rectifier. The output of the rectifier is connected to a 200 volt, 7500 microfarad electrolytic capacitor and also to the blanket. The blanket now sees 115 volts of DC (at 135 watts) with 0.7 volts of ripple. I had to slightly modify the existing thermostat (shorten its heating wire) so it would behave exactly as before. This is due to the "wasted" power dissipated by the current/voltage limiting 17 ohm resistor.

It works flawlessly and I now sleep in "polarized" comfort! I am figurin' that this may even cause some of my dislocated brain cells to straighten out. A friend of mine suggested that perhaps if I were to "float" on a lake, I might even point north.

All joking aside ... I did indeed build, and am using, the forementioned DC power supply for my electric blanket and at a cost of less than $15, using all new parts. I got the rectifier for a buck and a half and the 75 microfarad cap for $4.50.

I sure do hope you aren't gonna print anything negative about DC electromagnetic fields (I see a pun)! I also want to say that your editorials are at least half the reason I subscribe to *73 Magazine*. I enjoy them.

Gregory R. McIntire KE0UV
Belle Fourche S. Dakota

Gregory ... Hey, you came up with a simple fix for your blanket. Great idea. I was wondering how the thermostats would adapt to DC operation.

I haven't seen much yet on the effects of DC fields on cell growth and communications ... except one study which showed a remarkable cell effect when the cells were moved just a few degrees off the earth's magnetic field.

Just in case, I'm making do with blankets and a nice comforter ... Wayne.

New Direction for Scouts

Regarding your comments [Mr. Green's] to the "Something for Beginners" letter in the Feb. '90 issue, page 56, I heard something on TV that might be worth checking into.

A national Boy Scout leader said the Scouts were changing policy with regard to their direction. It was becoming more socially oriented to help correct problems like functional illiteracy, the drug abuse situation, etc. I don't know if the Scouts would be receptive to including some ham radio indoctrination within their organization, but it seems possible. Likely there have been cooperative efforts between Scouts and hams before during emergency conditions.

This group has a national leadership that can implement programs nationwide. They may like to include some of the benefits of amateur radio within their new outlook even if they haven't done so before. And this might help compensate for the loss of ham support through school systems (which are not guided at a national level, but are guided regionally). The aim, of course, is to encourage the growth of the hobby by gaining younger blood.

Roy Ekberg W0UO
Brownsville TX

Newcomer to Amateur Radio

As a newcomer to amateur radio I find *73* very much suited to my interests and reading style. I am especially pleased with Wayne's monthly comments (tirades?). I got into ham radio this summer after returning from a three-year Peace Corps stint in Botswana. A long-term friend (N4PIV) prodded me into it. I was into 1 lm during the 70s but could never seem to learn the code. So this summer I cracked the whip and worked from Novice to Extra Class in just 2½ months. By the way, I am 26 years-old, just completing a Masters degree in plastics Engineering at U. Lowell, Massachusetts.

I was dismayed with what I heard on the HF bands. I'd had far more fun and meaningful communications on 11 meters. Another friend, N1GYH, worked with me to get his Tech Class. When he listened to HF one night, with a gleam in his eyes that he was finally on amateur radio, his face nearly cracked as he heard the nonsense contacts on 20m.

I want to comment on Wayne's editorial in the Jan. '90 issue, specifically with regards to Africa being hopeless. To imply that there are no countries in Africa that have decent education is a lark. It may not be as readily available as education here, but then have you checked Boston's SAT scores lately?

I taught junior/high school for three years at a school named Shashe. We had the best teachers from around the world there. When I compare the education I got with the education I was giving, there is no comparison. The European teachers were far more qualified.

A group of 11/12 grade students begged me to start a computer club for them. I got the funds to buy a computer, which usually drew 20+ children a day. These kids had the technical knowledge to handle communications. A few comprehended the physics of electronics better than I did. The headmaster made money available to buy an amateur radio to start a club. I'm kicking myself now for not making time to get another AA2 station on the air. I didn't know any better.

My comment is: When somebody goes on a DXpedition to one of these countries, seek out the high schools. There are Europeans and North Americans with technical backgrounds (Peace Corps volunteers, WVRST volunteers, etc.) at these high schools. Identify a person who can introduce amateur communications to the teachers, then go home and have the club donate some old equipment (or new) to get the school's club on the air. That way, at least with children on the air, the conversations will be far less boring and meaningless. At the most maybe a future presidency will be encouraged to continue his/her education in electronics and do something to encourage development and prosperity in the RICHEST continent. Wayne, keep kicking, you've got a good forum.

Bill Discipio N1GWR/AE
Hampstead NH 03641

I read with interest your comments concerning YLs in ham radio and the electronics field. I assure you that you are correct in your opinion of the treatment of females and minorities in the field of electronics.

I have been licensed since 1970 and hold an Advanced Class license. In addition I hold an FCC General Class Radiotelephone (former first class) license and am National Business and Educational Radio (NABER) certified. I have been employed in electronics for over 25 years and enjoyed every moment of it. I presently work for the Pennsylvania Emergency Management Agency (PEMA) as a Radio Telecommunications Specialist, and own my own company (Colorado Electronics Services). How am I treated? Like a know-nothing woman. My only satisfaction is in knowing that I am usually the one sent to do the job because I know my stuff.

Going back several months to your article on EMP, all I can say is good luck. I have been preaching the same thing for years and am tired of talking to stone walls. Even the Emergency Management people—at least here in Pennsylvania—have a deaf ear concerning high speed digital communications, not to mention EMP protection. It seems that in a time of emergency the politicians would rather talk to each other than pass important traffic; therefore, there is a great emphasis on voice circuits with telephone being the most wanted. Try as you might you can't get it through their heads that the phones are the first to go in an emergency. The thoughts of others in-the-know, concerning the possibility of EMP caused by terrorist activities, are met with a head-in-the-sand position. The consensus is that if the politicians don't think of it themselves, the idea is not worth pursuing.

Your comments in the January 1990 issue about the educational system are right on the target. You have started me thinking about getting into the video teaching aspect of education. I taught electronics in a vo-tech school until the lack of enrollments caused a layoff.

You mentioned the experiments by Estep in contacting the spirit world on VHF. I remember reading about and trying similar experiments years ago. I got some funny results but never followed through. Perhaps there is more there; maybe I will retry the experiments with more modern technology.

While on the subject of communications with other worlds, I will inform you that I am the Net Manager for the MUFON (Mutual UFO Network) amateur radio nets. We have several nets on the different amateur bands. Time and frequencies are: Saturday 6 AM Eastern 7237 kHz, Saturday 9 PM Eastern 3960 kHz, Sunday 3 PM Eastern 28470 kHz, and Thursday 8 PM Eastern 28460 kHz. All of these nets have a lot of check-in stations as well as SWLs. They are open nets and anyone is welcome to join in the conversations.

Keep on preaching the gospel, knowing that a few kindred souls—even females—are attuned to what you are saying.

Leslie Varnicle WA3QLW
Camp Hill PA

Thanks for your letter ... and bravo on your MUFON work. Of course I've a theory ... wrote it up several years ago in an editorial that UFOs may be more involved with time travel than just aliens ... and that as such they can't permit too close contact without screwing up the future. They do seem to clean up after themselves very well.

Having read most of the books on the subject for some 40 years ... and been a member of most UFO groups at one time or another ... the data I've gathered seems consistent with time travel. That's one of the few consistencies.

I had a nice letter and a tape from Sarah Estep. Now I've got to make some time to see what I can do with a DAT recorder. That should increase the sensitivity enormously.

Right now I have to get outta here ... off to Poland and Czechoslovakia today for ten days. I'll be talking with the ham groups there ... and seeing what I can find in music to import and beef up their hard currency revenues ... Wayne

Amateur Radio's Image

I just read a recent article of yours in the December issue of *73*. I have had the desire to get my amateur ticket for years and haven't been able to conquer Morse code. I think a no-code ticket would be great. I know many others who have the same problem and have shied away from getting their ticket due to code. I was shocked to see only 100 Canadians took advantage of the great opportunity the no-code ticket would offer. I would be the first in line.

I also think it is hard for an experienced ham to understand what someone on the outside thinks of amateur radio. It is not appealing to hear constant radio reports (like "I run a Kenwood and a dipole," etc.). That is the major reason many young people think ham radio is boring. I think your idea of making contacts more interesting is perfect. Your idea of nets for UFOs, etc., is great. The airwaves need to be interesting to attract younger people. Amateur radio is competing with more things now than ever before. Like the home computer and modems.

Amateur radio is also suffering from an image problem. Most outsiders seem to think you need to be a college professor to be involved in it. They could be educated by public service ads, or some high profile hams could mention it on national TV shows.

Deith Belongia
Racine WI 53504

14 MHz Controversy

Your November "Never Say Die" asked for comments regarding the 14.275/14.313 controversy. This is my comment.

All human conflicts have two sides. I know nothing of how this mess got started. I only know that it is now a disgrace. I have heard immaturity on both sides, idiots and KV4FZ. He obviously has a problem. I feel bad that so many otherwise intelligent hams allow themselves to lose their tempers and therefore their reason. The immature ones delight in causing people to lose their temper. If we could only learn that weirdos must have an "ear." If the good guys would ignore them, they would at least tire out. Every time they get an acknowledgment, they gain strength.

As I see it, we have three separate problems which are interrelated: intentional jammers, objections to nets "owning" frequencies, and third-party traffic other than health and welfare or emergency.

I believe an attempt should be made by the amateur community to stop the present trouble. Perhaps you, the ARRL, or maybe the FCC could take a poll of the amateur community and find out how the majority feel. Then the FCC or Congress could be pressured to enforce the wishes of the majority.

I am in favor of assigning a specific frequency to a net with definite hours. This would give a net authority to use a frequency. The publishing of this information would reduce most of the unintentional QRM.

I am also in favor of allowing third party traffic, and see nothing wrong with the operation on 14.300 as it is practiced at this time. Few amateurs would purchase equipment and learn to use it if it could be used only rarely.

I am not yet a subscriber to *73*. I have only recently noticed your publication, and purchased Nov. and Dec. off the newsstand. It looks good so far, congratulations. I think I could learn to like you.

W.S Latham AB4PG
DeLand FL

"Safe" Communication?

I enjoyed the challenges (definitely plural!) of reading your January column, but I wonder whether you haven't missed a possible reason for the general level of apathy in the ham ranks. It seems to me that many hams may be drawn to the hobby because, paradoxically, they are not good communicators. Rather, they may be drawn by the patina of the "semi-technical" skills and procedures which allow them to pretend to communicate. Witness contesting! Witness packet bulletin boards! Witness CW!

A similar phenomenon seems to be a normal phase of American adolescent development, only the patina of choice is the telephone. Many teenagers seem to use the telephone as a learning tool on which they can practice their communications skills without the dangers of face-to-face communications. After they master the basic skills and jargon, they can move on to develop more intimate personal relationships face-to-face.

I wonder whether many hams might actually be afraid (too strong a word?—maybe just uncomfortable) of close personal contacts, so they pretend. Ham radio offers a multitude of substitutes for real personal communications, and it offers an almost perfect stage. These substitutes can be challenging and even lots of fun, but when the medium substitutes for the content, there is no communication!

It's no wonder that ham club meetings are, for the most part, uninspiring. What else could you reasonably expect from an arbitrary collection of mostly white men, most of whom are not really comfortable with personal contacts, who have adopted Roberts' Rules (another stifling way to pretend) to govern themselves? There also seems to me a sacred dictum (ARRL, *ex cathedra?*) that only certain topics are safe for ham club meetings.

Most of the hams I meet, on-the-air or face-to-face, sound like they could be interesting people underneath their ham-veneers, but I am frequently rebuffed when I try to move a QSO into something which might be interesting (but which might draw them into expressing a personal opinion)—"Well, I'm destinated [sic—yecch!]. I'll say 73s now and wait for your final." I don't know why I bother trying sometimes. I certainly have alternate uses for the modest time and money I spend on ham radio—like the local bookstore. I, like you, am an avid reader.

I wonder why you keep trying—I don't think it's for the money. You seem to enjoy the status of "prophet" (rabble-rouser), and you seem to have a genuine concern for the rest of us hams. I usually enjoy reading your columns and exploring my own reactions (both positive and negative). Most importantly, I learn something every time—I could have gone my whole TV-less life without ever hearing about the Lambada.

I am still thinking about your "expose" of the American public education system. I am a product of it in the '60s when we were trying to save the world from communism through advanced math, etc. Since our own kids have grown and gone, I've been out of touch with the schools. I have been vaguely aware that something's wrong, but I don't know enough about what's happening (not happening?). I also don't have a clear picture of what I expect, or what we need, so it will take me a while to chart out how to get there, and more importantly, how I might help. Thank you for challenging me to start.

Tom Russel NT4H
Portsmouth VA

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Number 2 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1

73's Revolving Door

Amidst a flurry of misspelled names and calls, one of the less necessary ham newsletters took a swing at me (so what's new?) citing the ever-changing *73* staff as proof that Wayne is awful to work for. Yeah, I'm a terror. As usual, the editor never bothered to check his information for reliability.

Yes, you bet I keep the door revolving at Wayne Green Enterprises. I don't fire many people. . . far too few, really. But that door is going to keep turning as long as I'm alive. I don't want staffers to stay here for a lifetime. I try to find people who are young and interested in learning everything they can about publishing. Then I do all I can to make their experience at WGE as educational as possible. People who refuse to take advantage of the learning experience and insist on doing the same damned thing for years I encourage to depart to make room for people who will take advantage of the career development potentials I have here.

WGE is not just a publishing company. . . it's also a publishing institute and is even registered as such in New Hampshire. It's also an entrepreneurial small business incubator. That's the way I've run my publishing businesses for the last 15 years.

In the last two years I've gotten rid of every "manager" in the place. Oh, I've tried to make management teams work, but I found they stifled progress. It shocked everyone when I cleaned out the general, business, ad sales and financial managers all at one time and personally took over their jobs a year and a half ago. Actually, I didn't have to do much additional work, I just set the staffers free who'd been held back by their "management." Our costs went way down and our revenues went way up.

I recently got fed up with the constipation in producing *73* so I eliminated all job titles. I redid the masthead with everyone just listed as "staff." Further, instead of articles sometimes having to wait weeks for an editor-in-chief to get to them, now they're tackled as they arrive by any of the staff who's handy.

My system has worked out well in the past. *73* editors have come aboard with little or no previous training and have gone on to some very nice jobs. Heck, one of them is running one of the largest PR agencies in California. And one of my circulation people is doing great with *Inc.* magazine. Another of my editors went on to edit *Infoworld*. My alumni are all through the publishing industry.

How do I run a business without managers? I do it with team leaders. Everyone works. None of this, "that isn't my job" nonsense.

I do most of my own work at my farm, which is a few minutes from the WGE building. I'm set up there with my laptop computer, FAX, a 2m repeater and a little ham rig. The big rig, beam, packet, SSTV, OSCAR setup and all is at the WGE building, where it's used more by the 73 staff than by me.

I pop into WGE twice a day for meetings and to see what problems need solving. I help with cover design ideas, okay artwork and see how things are going. At the farm I answer my mail, keep up with radio, computer, electronic and audio technology, write editorials for all my publications, write endless subscription letters, review new CDs, produce my own CDs (Greener Pastures Records. . . with a state-of-the-art recording studio at the farm).

Between giving talks at hamfests and ham clubs and attending music and electronic industry shows, I'm kept busy and have far too little time for skiing, skin diving and hamming. This year I'm scheduled to give ham talks in Dayton, Minneapolis, Munich, Vienna, Atlanta and Boxborough. The music and electronic shows are in Las Vegas, Los Angeles, Nashville, Chicago, Cannes. And that's just what I know about so far.

I'd like to take some time to see what I can do to help the artists and performers in the Eastern European countries get their music distributed in America in order to generate some badly needed hard currency for them. If these countries are going to change from communism to democracy, they're going to need a way for the artists who were state supported to earn money. I think I can help.

Then there's my work in education, which is coming along very well. I have to budget some time to get to colleges to lecture. . . and to work with colleges to help them cope with the '90s.

Locally I'm working with the Chamber of Commerce to make some badly needed local changes . . . and am the treasurer of the local hospital board.

Getting back to *73*. . . I have several goals for *73*. One is to make it more fun to read, and more educational. I'm particularly anxious to get amateur radio growing again by attracting youngsters to the hobby by the hundreds of thousands. I have some plans for doing this, but they're going to take some time and work.

I formed the National Industry Advisory Committee to help bring the ham industry and the FCC Commissioners together and perhaps even stem the tide of lost bands. I don't think the ARRL approach of suing the FCC and fighting them at every turn is a productive approach.

The present *73* staff is top notch. In addition, we're also tapping the technical expertise of Larry Antonuk WB9RRT. Mike Nugent WB8GLQ, the editor of *Portable 100* magazine, is also helping. And Jim Morrissett K6MH is leading the team. Jim first worked for me as the assistant editor of *CQ* magazine back in 1955.

So there you have it. I tend to look for youngsters with promise to work for *73*. I encourage them to learn everything they can and then move on to companies where they'll get better pay. *73*, which has lost money for years, probably will never pay big salaries, but it's a corking place to learn publishing. . . and to have a ball testing the newest of ham gear, going on DXpeditions and to hamfests.

I mentioned our business incubator. Right now we have 23 new businesses we're starting. These offer even more opportunities for learning new skills and getting more upscale salaries.

One that's doing particularly well is Music/NH, a new mail order CD company. Then there's Buys, Inc., which has been selling 10,000 or so CDs a month for the last year. And Greener Pastures Records, which just put out its first CD release. . . Scott Kirby playing Scott Joplin. We've got a bunch more in the works. There's always something exciting going on.

Our *CD Guide* electronic edition on CD-ROM has taken off in sales. Record stores and libraries are buying it. Philips has bought 30,000 copies for their new Headstart computer system.

We've got Indie Info Inc., a credit checking source for independent record companies. There's *Adventures In Music*, a publication for radio stations telling 'em what's new in CDs. And *Music Retailing*, which goes to over 10,000 record stores to let them know what's new and what's hot in indie music.

US News had a chart showing the average employee turnaround in America. We're doing considerably better than average. They showed 23% of the employees working less than one year.

So, yes, we do have a revolving door at WGE and *73* magazine. We do tend to lose people who aren't able to work as a team or who aren't really interested in developing their careers. Most of the people who move on to better jobs keep in touch and remain good friends.

I do try to make things as friendly as possible. One of our ad sales gals had a baby recently. She wanted to be able to stay at home to take care of her new baby, but

Continued on page 75

QRX . . .

EDITED BY LINDA RENEAU KA1UKM

ARRL President Urged to Resign

Five prominent radio amateurs have asked ARRL President Larry E. Price W4RA to decline his nomination for another 2-year term. The request, sent by mail, was signed by Stuart Cowan W2LX, William Orr W6SAI, Pete Hoover W6ZH, Joseph Schroeder W9JUV, and A. Prose Walker W4BW. The authors stated that they believe the ARRL under Dr. Price's direction has failed to ". . . adequately meet either the domestic or international challenges facing amateur radio today, and that a change in ARRL leadership is absolutely necessary if we are to survive these challenges in the coming decades." (From *Westlink.*)

Grant for HF Packet Research

A team of amateurs headed by Stephen Hall WM6P, of Simi Valley, California, received a $1,000 grant this year from the ARRL. The team will investigate the benefits of diversity reception for HF packet radio, and design practical diversity antenna systems, modems, and receivers. For a discussion of diversity reception and its potential benefits in amateur radio, see the chapter on digital communications in *The 1990 ARRL Handbook.*

Co-investigators in the team are Andy Demartini KC2FF of Clearwater, Florida; Wally Linstruth WA6JPR and Bill Lake WB6RIJ of Santa Barbara, California; Herb Duncan WE7L and Peter LaCount W8UXD of Sierra Vista, Arizona. (From *GRAARC.*)

New DXCC Countries

The ARRL Awards Committee has unanimously agreed to add Banaba Island T33 and Conway Reef 3D2 to the DXCC Countries List. No no activity is believed to have taken place from Conway (3D2), a territory of the Republic of Fiji, prior to the 3D2CR operation of April 1989, so contacts are creditable with the start of this operation.

Banaba (T33), part of the Republic of Kiribati, was formerly known as Ocean Island. A few operations with callsign prefix VR1 from Banaba occurred before the T33JS/T33RA activity of May 1989. They will also be creditable.

QSL cards may be submitted for Conway and Banaba on or after March 1, 1990. For more information, contact Don Search W3AZD at ARRL HQ. (From *The DX Bulletin* and *Watts New.*)

Amateur Radio Astronomy

If you'd like to get into amateur radio astronomy, an international organization exists to help you. For information on how to get started, write S.A.R.A. Membership Services, PO Box 4208, Tampa FL 33677, or call Jim Pitts, the Librarian and Educational Chairman of S.A.R.A, at (502) 459-5804.

While it's unlikely that amateur radio astronomers can compete with the huge antennas used by professionals, amateurs can pursue various rewarding projects: indirect monitoring of solar flares, meteor monitoring, imaging of strong radio sources, pulsar detection, and Jupiter studies. Most of these projects require simple, though sensitive, equipment and relatively small antennas. You do not have to be an electronic wizard to obtain thrilling results. Radio telescopes consist of the same type of equipment in amateur radio stations, only they are arranged differently. (From *Watts New.*)

Signals from Space

Easy-to-monitor signals from space include US and Soviet navigational satellites between 149.910 and 150.030 MHz. You can hear them on a 2 meter HT or portable scanner with a rubber duck. *MIR*, the Soviet manned space station, is loud and clear on 143.625 MHz FM. The cosmonauts on *MIR* ran a 2 meter operation on or near 145.550 using the calls U1MIR, U2MIR, and U3MIR.

You can hear the new Microsats beaconing on 435.07, 435.12, 437.025, 145.825, 437.075, 437.150, and 437.125. (From the *Nashua Area Radio Club Bulletin.*)

Automatic HF Data Transmission

The League has concluded that desirability of automatic operation on the HF bands has been firmly established. Last December 12, ARRL Counsel Chris Imlay N3AKD filed a petition with the FCC, seeking the adoption of rules to permit limited HF RTTY and data communication under automatic control. The petition seeks designation of the following band segments as being available, though not exclusively, for automatic control of RTTY and data transmissions: 3605–3615 kHz, 7035–7045 kHz, 10140–10150 kHz, 14090–14100, 18100–18110 kHz, 21090–21100 kHz, 24920–24930 kHz, and 28100–28120 kHz.

The Leagues's proposal seeks inclusion of automatically controlled AMTOR and Baudot as well. From the petition, ". . . AMTOR is more robust than packet radio and is used to bridge difficult radio paths. . . manually controlled Baudot RTTY 'mailboxes' (or MSOs) have been active in the Amateur Radio Service since the early 1980s. . . . Manual control. . . is an unnecessary burden on the mailbox system operators. . . . the benefits of automatic operation are shared by amateur operators worldwide and are instantly available to provide public service during disasters." (From *The ARRL Letter.*)

Land of Radio Enthusiasts

Japan lists over 5 million radio stations. These include 950,000 amateur radio stations, 2,390,000 CB-type radio stations, 1,540,000 portable/mobile radio stations, and 120,000 "miscellaneous" radio stations. The US lists a paper figure of approximately 509,000 licensed amateurs. (From the *B-N-T Bulletin.*)

Amateur Radio at Malta

When Gorbachev and President Bush met at Malta, amateur radio was there, too. Network news crews always have a few hams among them, and when not at work, they operate their improvised ham setups.

Steve Mendelsohn WA2DHF, ARRL's Hudson Division Director, took his Kenwood TS-130S along and strung a simple dipole off the hotel balcony. In 20 minutes he had worked all continents using the assigned Malta call of 9H3LO. Ed Tobias as 9H3LN and Tony Brunton as 9H3LM also joined in the fun.

The Soviet Union permitted special event station US1UGB to operate from Moscow, commemorating this event. If you made contact with that station, you can QSL direct to UK3A. No need to go through Box 88, Moscow, for approval! (From the *B-N-T Bulletin.*)

Stolen Transceiver

The Brevard County Sheriff's Department in Florida recovered a Yaesu FT-208 early last February. It has several identifying markings. If you think this radio may be yours, contact the Brevard County Sheriff's Office at (407) 631-6000, and identify the markings. The case number is 90-014450. (Submitted by Bill Newkirk WB9IVR via CompuServe.)

FAR Scholarships

The Foundation for Amateur Radio, Inc., plans to award 33 scholarships during 1990-91 to assist licensed radio amateurs. If you're a full-time student, or have been accepted for enrollment at an accredited university, college, or technical school, request an application now, by letter or QSL card. Request must be postmarked prior to May 31, 1990. FAR Scholarships, 6903 Rhode Island Avenue, College Park MD 20740.

TNX to QRX Contributors

Thanks to *GRAARC, The DX Bulletin, Watts New, Nashua Area Radio Club Bulletin, The ARRL Letter, the B-N-T Bulletin, Westlink,* and Bill Newkirk WB9IVR.

Number 4 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the June issue, we should receive it by March 31. Provide a clear, concise summary of the essential details about your Special Event.

APRIL 1, 1990

GROSS POINTE WOODS MI The South Eastern Michigan ARA will hold its 32nd annual ARRL Sanctioned Hamfest/Swap-n-Shop at the Grosse Pointe North High School from 6 AM-2 PM. Exams, Forums, and an on-the-air packet station. Advance tickets $8, $10 at the door. Advance tickets $2, $4 at the door. Talk-in on the W8FWC Repeater 146.74/.14. For more information, SASE to *SEMARA SWAP, PO Box 646, St. Clair Shores MI 48080-0646 or phone 313-323-4099 anytime.*

APRIL 7, 1990

BENTON HARBOR MI The Blossomland ARA is sponsoring their Hamfest at the Fair Plain Jr. High School from 8 AM-12 PM. Set-up at 6 AM. VE Exams. Free parking. Call *Lee Lull WR8R, 616-926-1747* to register before March 31. Tables (provided), $5. Admission $3. Contact *Paul Reissman WD8MWT, c/o B.A.R.A., PO Box 175, St. Joseph MI 49085 616-429-6230.*

LONGMONT CO The Longmont ARC Hamfest/Computer Swap will be held at the Boulder County Fairgrounds from 8 AM-3 PM. Admission is $3, tables are $7. A CAD system will be used to help all exhibitors make advance reservations for specific table locations. Contact *Bob Dornan WA2EKU, 1106 Fordham St., Longmont CO 80501. 303-651-3613.*

ROCHESTER MN The Rochester ARC will sponsor the 13th annual Rochester Area Hamfest & Computer/Electronic Show at the John Adams Junior High School. Set-up Friday the 6th from 4:30 PM-7:30 PM. Doors open at 8:30 AM Saturday. Indoor Flea Market for radio, computer and electronic items. Free parking. Talk-in on 146.22/.82 WØMXW. Contact *R.A.R.C., c/o NØHZN, 2824 NW 24th St., Rochester MN 55901.*

COLUMBUS IN The Columbus ARC Hamfest will be held at the Bartholomew County 4-H Fairgrounds between 8 AM and 2 PM. Talk-in on 146.79-600 Hz. Contact *Marion Winterberg WD9HTN, 11941 W. Sawmill Rd., Columbus IN 47201. 812-342-4670.*

APRIL 8, 1990

FRAMINGHAM MA The Framingham ARA is sponsoring a Flea Market at the Framingham Civic League Building to support the Dr. Carlton Crosby Memorial Scholarship Fund. Early bird admission $5 at 9 AM, general admission $2 at 10 AM. Six foot tables $12 in advance (includes one admission). Set-up 8 AM-10 AM. Preregistration for exams is strongly suggested. Exam info, *Dick WA1KUG, 508-877-0568.* Table info, *Jon K1VVC, 508-877-7166.*

APRIL 9, 1990

BOULDER CO The Boulder VE Team will hold VE Exams at the American Legion at 7 PM. Call *Barbara McClune NØBWS, 303-530-1872.* Pre-registration preferred, walk-ins welcome.

APRIL 14, 1990

CLARKSVILLE TN A Hamfest will be sponsored by the Clarksville Amateur Transmitting Society, Inc. at the Clarksville National Guard Armory from 8 AM-3 PM. Flea Market, Auction. Free parking. VE Exams, contact *Larry Burns WD4DBJ, Rt. 1 Box 162A, Indian Mound TN 37079* or telephone *615-232-6141.* Admission $2. For tables contact *Lucky Holeman KF4L, 411 Jordan Rd., Clarksville TN 37042 615-647-7804.*

BOWLING GREEN KY The Kentucky Colonel's ARC is sponsoring HAMBOREE '90 at the National Guard Armory. $2 advance, $3 at the door. Children under 12 free with paid adult. Tables $10. Talk-in on 146.25/.85 and 147.93/.33. Info/Reservations: *KCARC, PO Box 9781, Bowling Green KY 42102-9781. 502-843-2395.*

CLINTON TN The Oak Ridge Hamfest '90 is being sponsored by the Oak Ridge ARC at the National Guard Armory from 8 AM-5 PM. Admission is $3 per person. Contact *Gene Muncy KB4UMM, RT 8 Box 539, Powell TN 37849. 615-945-5349.* FCC license exams will be at 10 AM. You must pre-register before 4 April. Send a check for $4.95 made payable to WCARS/VEC, a copy of your license and a completed 610 form to *Ray Adams N4BAQ, 4325 Felty Drive, Knoxville TN 37918.* Bring original license and two IDs to exam.

APRIL 14-15, 1990

ABILENE TX 1st ARRL West Texas Section Convention & KCARC Swapfest will be held at the Civic Center by the Key City ARC on Saturday from 8 AM-5 PM, and on Sunday from 9 AM-4 PM. Dealer/Seller set-up 6 PM-10 PM Friday, 6-8 AM Saturday. Tables $2 each. VE Exams. Walk-ins OK. Pre-Register for $5, $6 at the door. Please send pre-registration by 11 April to *KCARC, PO Box 2722, Abilene TX 79604.* For information contact *Bill Jones N5DOX, 915-698-4606.*

APRIL 15, 1990

CAMBRIDGE MA A TAILGATE electronics, computer/amateur radio FLEA MARKET, will be sponsored by the MIT Electronics Research Society and the MIT Radio Society at Albany and Main St. from 9 AM-4 PM. Admission $1.50. Free off-street parking. Sellers $5 per space in advance, $6 per space at the gate, (includes 1 admission). Set-up 7 AM. Talk-in on 146.52 and 449.725/444.725-pl 2A-W1XM/R. Call *617-253-3776.* Mail advance reservations before 5 April to *Richard Brezina, 3 Ames Street, Cambridge MA 02139.*

APRIL 21, 1990

LAWTON OK The Lawton-Fort Sill ARC will hold their 43rd annual Hamfest at the County Fairgrounds from 8 AM-5 PM. No pre-registration necessary except for table space. Talk-in on 147.39/.99. Contact *Claude R. Malchette, 3411 NW Atlanta Ave., Lawton OK 73505. 405-357-5870.*

APRIL 22, 1990

CLEVELAND OH The North Coast ARC Spring Swapfest will be held at the North Olmsted High School from 9 AM-2 PM. Advance tables $5 each. Admission $3. Talk-in on 145.29 and 224.76 repeaters. Additional info on NCARC PBBS (C NO8M on 145.09) D NCARC/SWAPFEST.INF, or phone *Chuck K8RSH at 216-777-1595.*

SULLIVAN IL The Moultrie AR Klub will have their Hamfest 5 miles east of Sullivan on the Caldwell Road. Exams from 9 AM-12 PM. Walk-ins accepted. Tables $7.50 each. Limited space, first come, first serve. Tickets $4 advance or at gate. Contact *Ralph Zancha, 502 E. State St., Lovington IL 61937. 217-873-5287 evenings.*

SOUTHINGTON CT The 7th annual Southington ARA Fleamarket will be held in the Southington High School Cafeteria. Admission is a $3 donation at the door. Free for children under 12. 6 foot table space available for $10 in advance and $14 at the door. For table info send SASE to *S.A.R.A. 1990 Fleamarket, PO Box 873, Southington CT 06489.* Pre-register for exams. Send info to *VE Exams, 1990 Fleamarket, PO Box 873, Southington CT 06489.* Talk-in: 146.28/.88, 222.20/224.80, 449.25/444.25. Contact *Chet KA1ILH, 203-628-9346 5 PM-9 PM.*

WELLESLEY MA The Wellesley ARS will sponsor a special event at the Wellesley Senior High School parking lot from 9 AM-2 PM. Handicap accessible. Admission $2. Talk-in: 147.03/.63 (Wellesley Repeater). Contact *Gerry Driscoll NV1T, 617-444-2686.*

APRIL 27, 1990

DAYTON OH The Dayton-Cincinnati Chapter of the Quarter Century Wireless Association announces the 1990 annual QCWA Banquet, to be held the first evening of the Dayton Hamvention, beginning at 7:30 PM EST at Neil's Heritage House. Membership not required to attend. Contact *Bob Dingle KA4LAU, 657 Dell Ridge Drive, Dayton OH 45429. 513-299-7114.*

Special Event Stations

APRIL 2-4, 1990

FORT WORTH TX Southwestern Baptist Theological Seminary will operate NG5A at 1400-0000Z each day, to celebrate the 75th anniversary of its School of Religious Education. Frequencies: 28.375, 21.375, and 14.375, plus/minus QRM. For OSL card, send your OSL and SASE to *Southwestern Baptist Theological Seminary, (SWBTS), PO Box 22068, Fort Worth TX 76122.*

APRIL 7-8, 1990

LAUDERDALE COUNTY TN The Tipton County ARES Club will host Station KC7YL from historic Fort Pillow State Park from 0200Z 7 April thru 2200Z 8 April. Frequencies: 28.375, 21.375, 14.275 and 14.275. For certificate, send QSL and large SASE to *Herb Harrington WB4DPL, PO Box 402, Covington TN 38019.* Phone WB4DPL at *901-476-4445, or David Siglin KC4LTC at 901-837-8362.*

APRIL 8, 1990

DELAWARE Never ones to learn from past mistakes, the members of the Warminster ARC will conduct their second annual DXpedition to the rare state of Delaware, operating WA3DFU/3. Frequencies: 7.275 MHz, 14.275 and 28.375 MHz. CW contacts will be made on request. QSL with SASE to *Warminster A.R.C., Box 113, Warminster PA 18974.*

APRIL 11, 1990

MOBILE AL The Mobile ARC will operate K4RQO from the radio room of the submarine USS Drum from 1400-2400 UTC to commemorate the 75th Anniversary of US Naval Submarine Service. Frequencies: 3.965, 14.260, 21.380, 28.360 and local 2 meter repeaters. For certificate send OSL and 9 x 12 SASE to *Murray Flanders K4RQO, 9075 Howells Ferry Rd., Semmes AL 36575.*

APRIL 22-27, 1990

ARLINGTON HEIGHTS IL The USEPA5 ARC will operate KA9NLX on 160-10 meters, from 1400Z-2400Z daily to commemorate the 20th anniversary of Earth Day. A certificate will be sent upon receipt of a QSL card. Send to *John Paskevicz KA9NLX, 1423 N. Ridge Ave., Arlington Heights IL 60004.*

APRIL 28, 1990

GALENA IL The Great River ARC of Dubuque IA will operate Station WK9O from 10 AM-4 PM at the 36th Annual U.S. Boy Scout Pilgrimage, on the lower General band and Novice 10 meter band, SSB. No SAE, OSL required for certificate. Contact *Loran Schonhoff, 5710 North Menominee Rd., East Dubuque IL 61025.*

MANTEO NC The Raleigh ARS and the Outer Banks Repeater Association will celebrate the 200th Anniversary of the founding of the United States Coast Guard by operating Station W4DW in the General portion of all bands and the Novice portion of 10 meters, from 1200Z 28 April-1500Z 29 April. For QSL card send a #10 SASE to *RARS, PO Box 17124, Raleigh NC 27619.*

GARDEN GROVE CA The Clairmont Repeater Association will operate Special Event Station W6FZZ in honor of Samuel F. B. Morse's birthday. Hours will be 1800 UTC-2400 UTC. Frequencies: 28.350 and 21.300 MHz phone, and 14.050 MHz C.W. OSL to *CLARA, PO Box 7675, Huntington Beach CA 92615.*

Number 5 on your Feedback card

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS. Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters l or i, or even the number 7. Thank you for your cooperation.

I am looking for hams interested in starting a net for those interested in Cessna aircraft, particularly pre-1960 taildraggers. Also those interested in antique/classic aircraft of any manufacture, including home-builts. Contact *Scott A. Littfin NØEDV, 28579 County Rd. H, Webster WI 54893.*

Needed: Frequency modification for Heath SB—1400 for MARS or all-frequency operation. *Sean Connel, 4541 Longfellow, Sylvania OH 43560.*

I am looking for a power transformer for a SWAN 500 or a 117-XC power supply. Please call after 6 PM. *Ted Coats KA3TVZ, 4429 Baltimore Ave., Philadelphia PA 19104.*

Needed: A diagram and manual of the Hallicrafters SX-71, or reproduction of same, for which I will gladly pay all postage and duplication charges. I need information for alignment. Thank you very much. *Harry Evans, D.M.D., W4OFI, 10006 N.W. 81st Ct., Tamarac FL 33321.*

Wanted: ICOM FM Unit EX-106 for an ICOM 6 meter transceiver Model IC-551D. Contact *Piero A. Sassu N3FVG, 714 W. Marshall St., Norristown PA 19401.*

Wanted: Service manual and schematic for Realistic DX-300 shortwave receiver. Will pay costs. *Don Sylvain WA3WOD, 6021 Rossmore Dr., Bethesda MD 20814.*

Wanted: An Elmer. Nearest "Cities" are Tigard, Beaverton and Tualatin OR. I'm most anxious to get my Novice ticket and find some good, used equipment. *Toby Padgett, PO Box 23582, Tigard OR 97223.*

I'm trying to make a 2m digital setup out of flea market culls. Need schematic and/or manual for Simpson Model B marine radio, Computer Devices Teleterm 1030, and Ramtek 8025ag. Will pay copy cost, but write first. *Joel S. Look W1KCR, 35 Goff Ave. Apt. 507, Pawtucket RI 02860.*

73 Review

by Bill Clarke WA4BLC

The Ten-Tec OMNI-V

So quiet you don't know it's running.

Ten-Tec, Inc.
Highway 411 East
Sevierville TN 37862
Phone: (615) 453-7172
Price class: OMNI-V HF Transceiver $2245
Options: 961 Power Supply, $239;
301 Desktop Tuner, $89;
705 Desk Mike, $69.

Ten-Tec recently introduced a new rig unlike any of the imports. In fact, there's no other rig like it on the market. This rig, the OMNI-V, is a super-performing, extremely quiet, "ham bands only" HF transceiver.

The OMNI-V HF transceiver features microprocessor control (through an RS-232 port via computer, if desired), PLL synthesizer with crystal mixed oscillator, and 25 memories. The memory channel will hold the frequency, mode, and filter selection. Optional filters are available to suit any need. It also has a voice frequency announcer option and an internal clock/calendar.

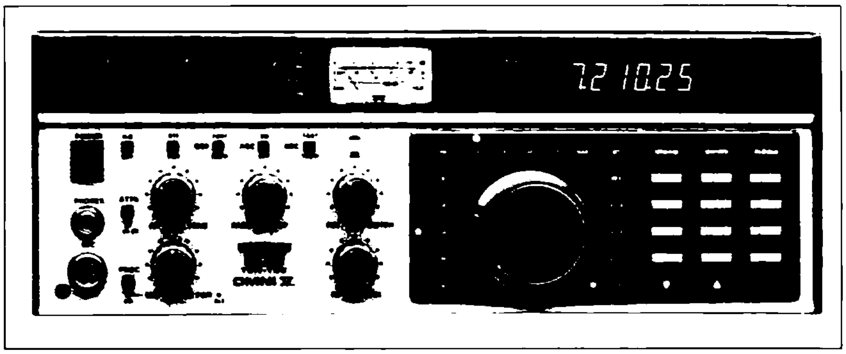


Photo A. The OMNI-V, showing the front panel layout. Notice the large digital display and large number of simple push-button controls.

Packaging Counts

The OMNI-V arrived in two boxes, one for the transceiver and one for the optional Model 961 power supply. The boxes are built to prevent any chance of damage during shipping, short of total crushing. Each unit was individually wrapped in plastic for further protection. After unpacking the transceiver and the power supply, I placed them on my desk to determine their final positions.

The OMNI-V, compared to many of the imported transceivers I have used, is formidable in size. But, unlike most imported transceivers this size, it's not a desk-crusher because it has an external power supply (with a speaker on its front panel). Not only does an external supply save weight, it also saves on internal heat buildup caused by built-in power supplies. A large set of fins on the rear panel take care of cooling. There is no fan to make noise or need replacement, but an external fan is recommended when running continuous full power (RTTY, etc.).

Front Panel

The OMNI-V's large digital display, consisting of blue fluorescent characters half an inch high, stands out. The second notable feature is the fine receive audio (more on this later).

There are enough controls on the front panel to allow tailoring of operation to suit nearly any operator or circumstance. In fact, there are 56 controls on the front of the OMNI-V, and a few others on the rear panel: VOX, SIDETONE, MONITOR, and various inputs and outputs, such as AUDIO, RTTY, and XVTR. However, most controls are simple push-buttons.

Nothing is difficult or unusual about operating the OMNI-V. With the exception of the memory section, an experienced ham can "plug in and play" the radio right away. After connecting the OMNI-V to the power supply and to my antenna system, I turned it on and tuned to my favorite portion of 75 meters.

Tuning In On the OMNI-V

The OMNI-V sent to me for review had all optional filters installed, the voice frequency announcer, and the optional remote tuning knob. I sampled every feature of the OMNI-V except RTTY, for which I currently have no equipment.

See Photo A. You select the band and control the memory from the keyboard on the right side of the front panel. From a column of switches directly to the left of the main tuning knob, you select the mode. You control the VFO from the column of switches to the right of the tuning knob, and select the filter from the row of switches above the tuning dial.

Receive and transmit variable controls, AGC, attenuator, processor, and noise blanker are all located on the left side of the front panel.

After selecting the band and mode of operation, you can quickly tune up/down with the up/down buttons, at 10 kHz per push. FAST tune selects a 30 kHz step.

The main tuning dial is large, has a hefty smooth feel, and a finger-hole. The digital display shows the current frequency down to 10 Hz. The 10 Hz digit can be disconcerting to the uninitiated, as it only takes a slight movement of the tuning dial to move 10 or 20 Hz. Selection of FAST tuning increases the tuning speed of the dial.

Memory usage required a little study of the operating manual, but once I learned, it was fast and easy. You can switch from VFO A to VFO B at the push of a button. Split operation is also available at the push of a button. The VFO in use is indicated on the display. Scrolling with the main tuning knob is a strong feature of the memory system.

The selectable filters system is great. Using the 2.4 kHz filter as standard for SSB reception gave excellent quality audio. When the going got tough, switching to 1.8 kHz dealt well with thick QRM. Using the 500 and 250 kHz filters really got me into the weak ones on CW. Selecting NARROW kicks in further filtering at the 9 MHz level and gives you steeper skirts on the passed signal.

For greater selectivity, you can add optional filters at the 9 MHz level to the existing 2.4 kHz filter. For example, you can install a second 2.4 kHz filter to give a total of 16 poles in this section.

The metering circuit displays FWD (forward), REF (reflected), Ic (final current draw), and PROC (processor) levels on a nicely backlit multi-scaled meter.

The BPF/FADE (bandpass filter) controls allow the user to tailor bandpass action to suit the situation. The amount of bandpass action is variable with a width of 35% of the selected center frequency at −6 dB points (from manual).

PBT (passband tuning) performed as expect-

ed, providing emphasized high or lows, and a good means of control over received audio. Receiver audio response can also be varied by the TONE control, although I found it to have only minimal effect.

There is no RIT (offset tuning) control. However, by using the alternate VFO (in split mode), you can effect a means of offset control. Although slightly different in operation from the RIT I am familiar with, it proved simple and effective.

AGC is selectable from the front panel. Being able to turn off the AGC when the noise of man (QRM) is strong, allowed adequate reception by manual control of AF and RF gain.

The NOTCH filter is very effective with its 50 dB depth, but like all other current production ham transceivers, it's sensitive to operate. I much prefer my Datong Automatic Notch Filter for removing carriers and heterodynes. I really would like to see the manufacturers pick up on automatic notch filters.

The Ten-Tec OMNI-V

General Specifications	
Frequency Range	160–10 meters in twelve 500 kHz segments 30 kHz over-shoot on band ends
Control	Microprocessor controlled digital PLL synthesizer with crystal mixer oscillator
Resolution	10 Hz
Display	7-digit fluorescent
Stability	1 PPM per degree C at 29.999 MHz (worst case)
Accuracy	±100 Hz at 25 degrees C
Power requirements	RX 1.5 A (13.8 VDC) TX 20 A (13.8 VDC)
Construction	Aluminum chassis, extruded front panel G-10 Epoxy PCBs
Dimensions	5.75 x 14.75 x 17 inches (HWD)
Weight	16 lbs.
Transmitter	
Modes	USB, LSB, CW, RTTY (FSK & AFSK), FM (optional)
DC Power Input	Max 200 W at 14 VDC CW, SSB, FM. 100% duty cycle for max 20 minutes (continuous w/auxiliary air cooling heatsink)
RF Power Output	25–100 W adjustable w/front panel control
Microphone	Low-Z (5 mV at −62 dB)
T/R Switching	SSB VOX/PTT, CW Fast/Slow QSK
CW Sidetone	Adjustable tone/volume
SSB Generation	9 MHz 8 pole XTAL filter w/balanced modulator
Carrier Suppression	60 dB typical
Unwanted Sideband Suppression	60 dB typical at 1.5 kHz tone
Spurious Output	>45 dB below peak power output
TX Antenna Output	50Ω unbalanced
Meter	Switchable forward power SWR Collector current Audio processing level
CW Offset	600 Hz
FSK Shift	170 Hz
SSB Monitor	Jack output
Receiver	
Modes	USB, LSB, CW, FSK/AFSK, FM (optional)
Sensitivity	SSB/CW/RTTY 0.15 µV at 10 dB S/N @2.4 kHz FM 0.30 microvolt at 12 dB SINAD @15 kHz
Selectivity	SSB Std 2.40 kHz at −6 dB, 3.36 kHz at −60 dB SSB Opt 1.80 kHz at −6 dB, 2.90 kHz at −60 dB CW Opt 0.50 kHz at −6 dB, 1.40 kHz at −60 dB CW Opt 0.25 kHz at −6 dB, 0.85 kHz at −60 dB FM Opt 15 kHz at −6 dB, 30 kHz at −60 dB
Attenuator	Approx. 20 dB
IF Frequencies	1st–9.0 MHz 2nd–6.3 MHz (FM 455 kHz)
RX Antenna Input	50Ω
Image Rejection	>60 dB
IF Rejection	>60 dB
Noise Blanker	On/Off adjustable width
S-Meter	50 µV at S9
Dynamic Range	97 dB typical
3rd Order ICP	+12 dBm
Squelch Sensitivity	<0.6 µV
Passband Tuning	±1.2 kHz
Audio Output	1.5 W at 8Ω with <2% distortion
Notch Filter	250–2.2 kHz 50 dB notch typical
Audio Bandpass Filter	4 pole Variable center frequency 220–1.7 kHz 35% bandwidth at −6dB Variable fader
Tone Control	Variable 15 dB rolloff at 5 kHz

QSK...

Here is where Ten-Tec shines. If you have never operated CW with full break-in, you must sit down and try it with the OMNI-V. You can clearly hear between the characters you send. No more throwing the TRANS switch and leaving it on until you go K. A real class feature.

The side tone is completely adjustable on the rear panel for pitch and level.

The speech processor passed the acid test of local and DX operation. I found it unobjectionable on local 75 and 40 meter operation, yet very effective, and it really punched out for DX and weak 10 meter working. All in all, the unsolicited audio reports I received were good to excellent. No one said, "Turn the processor off!"

The RF output control operates seperately from the MIKE gain control, and allows you to change your actual output power. This is perfect for controlling RF input to an amplifier.

On the rear panel is a MONITOR LEVEL pot that allows you to hear your own signal through the receiver's audio section. This is for setting speech processors and other audio controls for the transmitted voice signal. Headphones are required to prevent audio feedback.

The OMNI-V is current limited at 20 amperes. This prevents the final transistors from being damaged when the antenna system is not matched.

The clock/calendar feature is nice, although I had little use for it, as I have a wall clock in my station.

An external PTT jack on the rear panel provides for foot (or other) switches.

The operating manual is very complete, with a theory of operation, operating instructions, and circuit diagrams.

Looking inside the Ten-Tec will be a surprise to most modern transceiver users. There is space inside to work and move around. The boards are mounted apart, and plug-in wiring harnesses are used for interconnections. There is no crowding of components on the boards.

Receiver Audio Quality

Overall, the OMNI-V does extremely well with its receive audio. The internal speaker is more than adequate for most uses, and the optional power supply with its built-in speaker is even better. SSB signals seem to have a certain "audio presence" lacking in most of the other rigs on the market. This high quality audio was even more emphasized when I feed the OMNI-V's output to my station audio system.

I am a heavy user of 75 meters during the night hours, and as such I must live with the summer static levels. The OMNI-V hears through this junk better than any receiver I have ever operated. I tried duplicating this reception with my other rigs, using various

speakers and filters. I was not successful. The OMNI-V does not hear static crashes well, and that's fine with me.

I asked other operators to listen to the receiver, then asked them what they liked about it. Each mentioned the "presence" of the received signals and the general lack of QRN.

To compare the OMNI-V to a typical PLL-based transceiver, I used my ICOM IC-751A. I found that on the ICOM, a typical 59 + 10 dB signal on 75 meters could be difficult, or at least uncomfortable to copy, when the static crashes were rolling in at 15 to 20 over S9. Switching to the OMNI-V and listening to the same 59 + 10 dB signal, the static crashes were reduced to below the 10 dB level and the copy was significantly improved.

This silent effect is quite similar to switching from a PLL-based transceiver to an older tube-type rig, such as a Collins or Drake, under the same noise conditions. Unfortunately, the latter rigs offer none of the niceties of solid state microprocessor based operation.

Praises—What I Like the Most

1. I cannot say enough about the quality of the receiver audio. It is absolutely excellent.
2. The large digital display is very easy on the eyes; you can read it from across the room.
3. The voice frequency announcer eases operation for the visually impaired.
4. Ten-Tec has provided a real relay for controlling linear amplifiers (including older ones).
5. Memory RAM and the microprocessor operating system do not require a backup battery (the clock/calendar does). This feature can be very important. For example, my ICOM 751A must have the microprocessor reprogrammed if the lithium backup battery fails.
6. The OMNI-V is a CW operator's dream.

Yawns—OK

1. The clock beeps at 16 minutes past the hour to remind the operator that WWV propagation information is being sent on 10 MHz. I personally found this to be annoying, but someone else may find it a valuable reminder.
2. The TONE control lacks authority.
3. The clock/calendar feature is not necessary.

Boos

1. An S-5 birdie breathes fire at 21.330 MHz (factory aware of this problem).
2. The VFO tuning knob needs a dial lock.
3. There are no provisions for AM operation (not a problem for most operators).
4. The plastic base of the desk mike is too light in weight.

Warranty Service

Normally, I wouldn't include warranty information about a new piece of equipment, but just read this quote from the Ten-Tec warranty page:

WE ENCOURAGE SELF HELP. Taking the covers off does not void the warranty. In many cases our customer service technicians, with your help, can identify a faulty circuit board or part. When appropriate, we will send you a replacement board which you can change. This will be shipped on a 30 day memo billing, and when the defective board is returned, we will issue a credit.

Having been in the service end of ham radio for a very long time, I can state emphatically that you will get no similar service from any other manufacturer of ham equipment.

The Secret of Silence

Ten-Tec has been extremely careful in designing the interaction of the crystal oscillator and LO mixer. Phase noise in the OMNI-V depends entirely upon the design of the 5.0–5.5 MHz synthesizer. In practice, the synthesizer is actually two loops operating at 200–220 MHz, tuning in 400 Hz steps, and divided by 40 to produce the necessary 5.0–5.5 MHz output. The division by a factor of 40 reduces the output frequency; but more importantly, it reduces the phase noise and spurious levels by a factor of 32 dB. That is, it's 32 dB quieter than a normal PLL-type circuit.

The synthesizer's output signal of 5.0–5.5 MHz is then mixed with the output from the crystal oscillator and filtered through a bandpass filter, amplified, and then filtered through a 9 MHz notch filter. Crystal and filter selection is microprocessor based.

The receiver is inherently quiet due to the PLL-based VFO and use of crystal oscillator mixing circuits, versus the typical PLL-only circuitry found in most current HF receivers/transceivers. By employing crystal oscillators and mixing circuits for band selection, a large percentage of internally generated noise is eliminated.

Crystal mixing circuits are limited in bandwidth to the excursions allowed by the VFO. In this particular case, the standard VFO output of 5–5.5 MHz is derived from a PLL circuit and mixed with various crystal oscillators to arrive at specific bands. Each band is limited to a 500 kHz width. Band selection and switching of the desired oscillator and mixer circuits are done by microprocessor controlled circuitry.

Because of this care in design, the OMNI-V is a real performer with some of the finest receive audio I have ever heard on any ham equipment. ■

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your *opinion* of each article or column.

Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

HAM PROFILES

There are no "average" hams!

Photo A. Tom Comstock shaking hands with Kevin Biekert KB5AQV, with Alan Cross standing by. Along with a plaque, the Hiram Percy Maxim Memorial Award included a check for $1,000.

Photo C. Last Christmas, Arthur Tan AB4RL—yet another handsome young ham, took a break from DXing long enough to open his presents.

Award-Winning Ham

Kevin Biekert KB5AQV, a senior at Clear Lake High School in Houston, Texas, received his first amateur radio operator's license when he was 15, and less than two years later, he earned his Extra. A wall full of certificates won in contests and special events testifies to Kevin's enthusiasm.

In November 1989 at the HamVention in Houston, the ARRL presented Kevin with the Hiram Percy Maxim Memorial Award. This award is given annually to a ham under the age of 21 who best exemplifies the ideals of amateur radio: service, communication, and experimentation.

Kevin helped establish the Clear Lake Amateur Radio Club (CLARC), which has grown from seven to over 150 members. During Hurricane Chantal, Kevin helped with emergency communications. Recently, he has been assistant teacher in a Novice class.

Almost every Saturday evening for the past two years, Kevin, sometimes with friends and family (both his parents are hams), enjoy QSOs with Serge RA9YK, Len, and other friends in Barnaul, Siberia. These talks have led to an exchange of information, pictures, books, flags, and most important, friendship. By the time you read this, Kevin and his family will probably have visited their friends in the Soviet Union, as their trip was scheduled for March.

(Submitted by Jim Heil KB5AWN and Bob Biekert KA5GLX, editors of CLARC Chronicles.*)*

Photo B. Steve Mindy KF8CP, a handsome young ham, is studying for FEMA certification.

There's No Stopping This One

Thirteen isn't an unlucky number for Steve Mindy KF8CP. Thirteen months after passing the tests for his Novice license, Steve earned his Extra—on his 13th birthday.

Before his family moved to the Detroit area last summer, Steve (ex-N2IYA) was a familiar voice on the repeaters around Buffalo, particularly on the traffic nets. His proficiency as a traffic handler received recognition in the spring of 1989 when he was appointed an ARRL Official Relay Station. At that time he was a seventh-grade student in East Amherst, New York.

Not one to be content with chatting on the repeaters and DXing on 10 and 20 meters, Steve is currently studying for Federal Emergency Management Agency certification so he can get involved with RACES activity.

Currently, he's helping a neighborhood fourth-grader study for his Novice ticket.

(Submitted by Jack Mindy KF8CY.)

Ham Son Hooks Dad

Arthur Tan AB4RL, Extra Class amateur radio operator, became interested in radio after joining the Boy Scouts. He was fortunate to have Don Williams AB4IO as his scoutmaster.

Arthur and his father, Peter Tan, enjoy going to hamfests and getting ". . . lost in a sea of colossal fraternity." And what does his dad hear the most about from AB4RL? DX! He talks about countries his dad has never heard of before. "Contests are a killer around here," Peter Tan writes. "I hear Morse code at the oddest hours of the morning. I think I'm *dreaming, but then* I realize it's *my* son chasing another new country. . ."

Arthur shares his interest and enthusiasm with anyone who will listen, including his father. Apparently he's succeeded with the latter; Peter Tan writes, "We are in the process of getting a tower and beam up. I think that will be fun." Arthur has also taken part in teaching at the local community school, and in the fall of 1989, Arthur was involved in the area Field Day at the IBM Radio Club and SFDXA N4TL operation.

Besides radio, Arthur is interested in tennis, music, and computer programming. He plays the piano, violin, and trombone.

Here are some parting words from Peter Tan to inspire all young hams who hope to hook Mom or Dad: "I must admit that ham radio has made me, my family, and most of all my son a better person."

(Submitted by Peter C. Tan, ham-to-be.)

10 GHz Fun

Easy way to get on the 3cm band.

by C.L. Houghton WB6IGP

Want a cheap and easy way to get on 10 GHz? This 30 MHz IF strip and modulator allows you to put together a very inexpensive system for 3 cm operation. Combine this transceiver with a Gunn oscillator and a Polaplexer mount attached to a small dish antenna, and you are ready to go! (See the October 1987 issue of *73 Magazine* to learn how to build the Polaplexer mount.)

Overview

Let's look at what is required for a complete system operating on 10 GHz. The October article describes the Polaplexer detector and circular waveguide to which is coupled a Gunn oscillator. I used the Solfan alarm type available from many burglar alarm companies. *[Ed. note: Solfan, now defunct, also had a broad line of passive infrared detectors used in intrusion detectors and as actuators for door openers. Don't try to convert an infrared detector using these techniques.]* Being inexpensive, it is not varactor controlled. Adding just a power supply modulator and IF amplifier operating at our IF of 30 MHz complete the package! Figure 1 is a block diagram of the complete 10 GHz system.

Transmitter Circuitry

The transmitter consists of a single Gunn oscillator unit. Many different types exist. The best known unit is made by Solfan, and it can be found throughout the US and Canada.

The output power of an unmodified Gunn oscillator cavity runs about 10 mW. (I recently modified these cavities with high power Gunn diodes that have a power output of about 100 mW. I will make these available soon.) The Gunn oscillator is supplied with about 10 VDC (positive for the Solfan) from a variable voltage regulator. This regulator is modulated by a single CA-3130 op-amp serving a microphone amplifier. (The LM-386 and CA-3130 are available from Jameco.)

Now see Figure 2. The output of the microphone amplifier is capacitively coupled through a deviation control (variable resistor) to the voltage-adjust terminal of the power supply regulator. A small variation in audio voltage on this adjust terminal varies the voltage of the power supply which in turn varies the operating frequency of the Gunn oscillator, providing FM. An option on the PC board allows use of Gunn oscillators that have varactor frequency control.

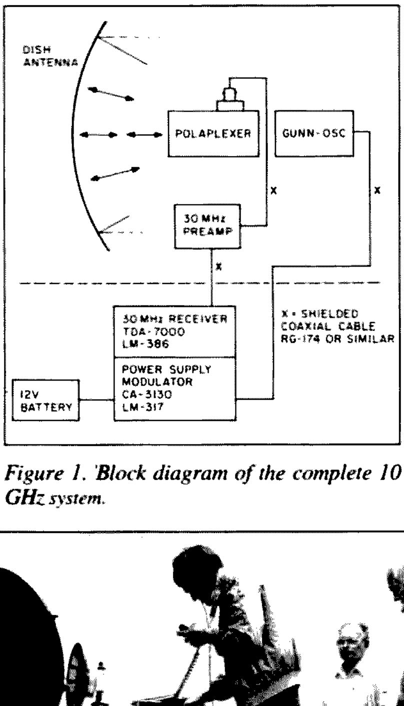


Figure 1. Block diagram of the complete 10 GHz system.

Receiver Circuitry

Figure 3 shows the WA6EXV 30 MHz 40673 FET preamp. The output of the Polaplexer detector diode (MA/COM 1N23WE) is coupled to the input of the single chip receiver system, operating at 30 MHz. For first-time operation, the detector and receiver can be connected together. You can improve operation, however, by adding an IF preamplifier between the detector diode and the 30 MHz IF amplifier-receiver. I tried several types of preamplifiers and use either a U-310 grounded gate FET or a 40673 FET. When the full system was tested on a noise meter at 10 GHz, the system noise figure was about 12 to 14 dB.

The heart of the IF amplifier is a Signetics TDA-7000 single-chip receiver. This chip has an input sensitivity of 5 microvolts for full quieting and is capable of operation directly to about 120 MHz. I am really impressed with this chip in that it operates with very few external components and does its job so well. It's hard to believe that this one chip converts the 30 MHz IF signal direct to headset level audio. This unit is an improved version of my original receiver IF amplifier that appeared in *73 Magazine* in October 1986. Operation of the unit was quite good and provided the vehicle to easy construction and operation on the 10 GHz "X" band or other microwave frequencies.

This article updates the original unit and adds several unique features. Before, when operating the IF amplifier with several stations on 10 GHz, there was no easy way to offset the 30 MHz IF strip to allow for incremental tuning. This was needed, however, to keep the Gunn transmitters on frequency and compensate for small frequency errors in the receiver IF amplifier. This

Kelly N6IZW operating the W6OYJ Polaplexer and 10 GHz SSB transceiver from the top of Mt. Soledad in California, while several other members of the San Diego Microwave Group look on. The transceiver drives a 10W traveling wave tube (TWT) amplifier. They made a contact over a 174 mile path, to a receiving system on Mt. Pinos. [Photo by author.]

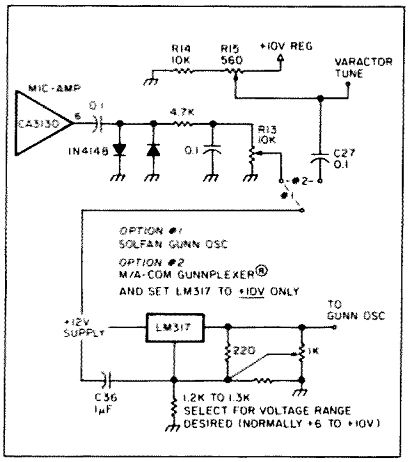


Figure 2. Microphone input modulation circuit.

was due to the 30 MHz IF not being exactly centered on 30 MHz on all units. Without it, you would continually adjust your Gunn's voltage slightly to improve reception clarity and both stations would soon "walk" each other out of sight, in continually adjusting frequency to make up for this difference. To compensate for this, a varactor diode was installed on the oscillator coil of the IF amplifier and adjusted by a pot on the front panel to change the IF frequency for a RIT offset. This allowed fine frequency netting of both stations and removed one drift problem from this transceiver's operation.

Users also soon begin to want a smaller PC board to make a more compact system. Additionally, there was no provision for making the unit adaptable to the very fine MA/COM Gunnplexers available from Microwave Associates. In this updated version, I wanted to make this unit useful for home-brew construction. After all, the main object is to have a lot of fun operating a home-constructed, inexpensive 10 GHz transceiver.

The Signetics TDA-7000 chip is really very simple. All that is required to put the chip into operation is setting the oscillator coil to the desired frequency. The low power output from this circuit is not easily detected by a grid dip meter, so I usually set receivers up by injecting a signal at the desired IF of 30 MHz.

If you live in an area with modest power FM broadcast stations nearby, as I do here in San Diego, you can touch the input pin with any metal object and hear a multitude of FM broadcast stations that are harmonically related to the oscillator frequency. Proper shielding and limiting the input to 30 MHz solves this problem.

The remaining functions are supported by fixed values of capacitors tied from the chip's pins to +5 volts not grounded. This might seem odd to most, but I assure you, it is proper. The circuitry on board the chip has an internal oscillator, mixer, IF limiter-amplifier, and a demodulator with a frequency locked loop operating at an IF of 70 kHz. Toss in about a dozen external capacitors, a few resistors, and a coil, and you have a complete basic system with operation to over 100 MHz. By selecting various values for a few components, the bandwidth can be changed from 4.5 kHz to about 75 kHz. The unit as shown in the schematic (Figure 4a) is set up for 25 kHz bandwidth. Table 1 shows the component values for different bandwidths.

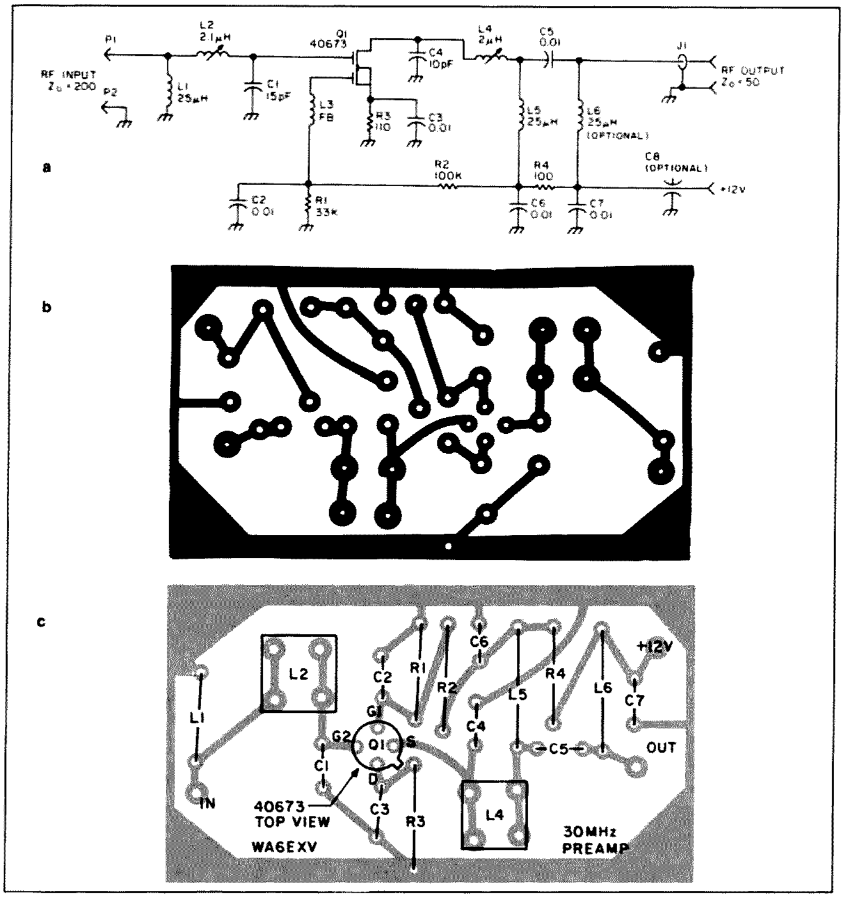


Figure 3. (a) Schematic, (b) PCB foil diagram, and (c) parts placement for the 30 MHz preamp.

Reliability

Of over 100 units locally home-brewed, fewer than 5% failed. Only two had defective ICs; most of the other failures were simple oversights in building.

There is always one unit that defies gravity. Such a unit was shipped to me for repair after I could not isolate the trouble over the telephone. It drove me nuts! I replaced quite a few suspicious components, including the TDA chip, and it still did not work. All voltages seemed proper, but the chip just would not function at RF. In desperation, I used the chip in another receiver board. This proved the chip good, so the trouble was on the board. On detailed inspection, I found that the unit had been put together with *acid-core* solder. This is a paramount no-no! It looked good but had high leakage all over the board. After giving the board a complete cleaning, resoldering with rosin solder, and degreasing with lacquer thinner, it performed quite well.

PC Description

In addition to the IF 30 MHz receiver, the printed circuit board contains a small audio amplifier, S-meter circuitry, and a microphone amp (see Figure 4b). This makes for a crowded PC board. Additionally, there are the power supply regulator chips for the 5 volt, 10 volt, and Gunn diode supplies. The circuit board is double-sided: the top foil acts as a ground plane, the bottom foil is the actual circuit. I prepared the printed circuit board by first drilling all holes that do not require grounding to the top ground foil surface. (I used a #65 bit, about 0.035 inch. Drill bits costing about 50¢ are available from model train (HO) hobby stores.)

After drilling all holes that are not to be grounded, I reamed out the top ground foil with a larger drill, 3/16" or so, giving a clearance around the component leads when inserted on the board. Once the reaming for the non-grounding holes was completed, I drilled the remaining holes. These were not reamed out allowing the grounding leads to be soldered to the top *and* bottom foils. This gives the very short low inductance ground leads, making for very stable operation.

PC Board Assembly

I usually install the resistors first to get the lay of components on the PC board. Once a few parts have been placed on the board, the

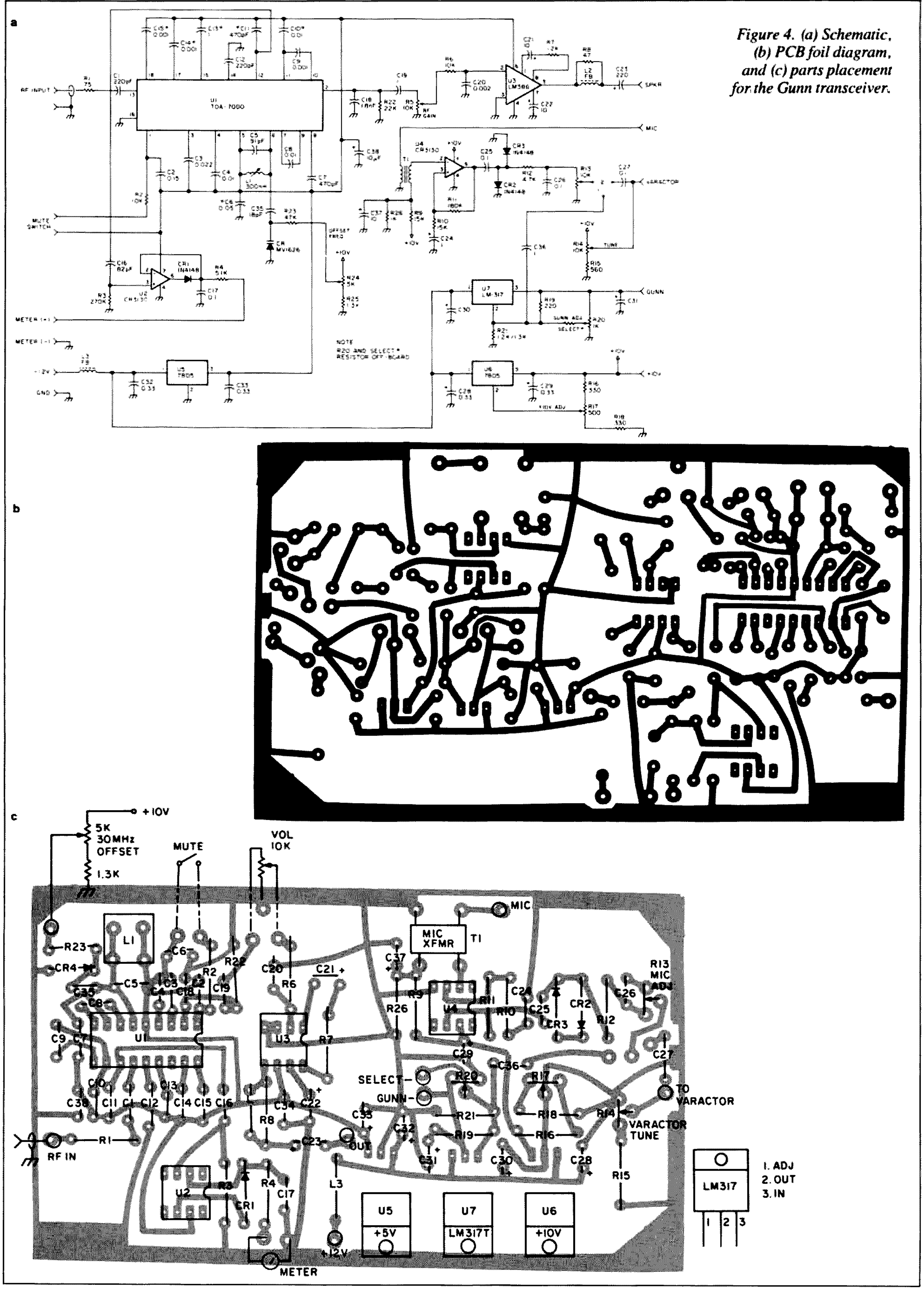


Figure 4. (a) Schematic, (b) PCB foil diagram, and (c) parts placement for the Gunn transceiver.

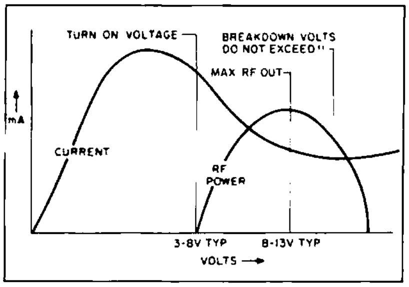


Figure 5. Gunn diode I/V curve.

rest is simpler. After most of the components are assembled on the PC board, check the power supplies for proper operation before mounting the chips. (I mount the TDA-7000 last.) Primary power for the unit is provided by either an external or internal 12 volt battery. I hooked a five-foot-long connecting cord to a surplus 2½ Ah lead-acid battery similar to the size of a motorcycle battery. The capacity allows many hours of continuous operation without recharge.

The 5 V supply is standard with a 7805 +5 V regulator. The Gunn power supply uses a LM-317 adjustable voltage regulator, providing 6 to 10 V adjustable for frequency control, and has audio modulating its adjust terminal. The 1k adjust pot (R20) and its fixed limit (select) resistor are mounted off-board, allowing front-panel frequency adjust for use with non-varactor cavities. In its use as supply to a varactor-type cavity, the voltage of the LM-317 is fixed at 10 V and the microphone output deviation control is coupled to the varactor voltage tune line for transmitter modulation. See Figure 2. The main reason for using fixed resistors in the adjust circuit of the LM-317 is that more than 12 V may destroy your Gunn diode. In the event of high battery voltage, the LM-317 limits the voltage to a level that is safe for the Gunn diode.

The 1k tuning pot is set with the series resistor (select) to limit the voltage range to a maximum of about 10 V. You can omit the two extra resistors, using just the 220Ω, and replace the fixed adjust resistor with a single variable. The +10 V supply uses a 7810 fixed regulator. However, you could use a single 7805, referenced above ground, allowing it to provide other than its normal +5 V. It holds down costs and doesn't provide high currents, so it works very well in this application. Most of the regulators can be obtained at Radio Shack. The 7805 is RS #276-1770, and the LM-317 is RS #276-1778.

Alignment

After power supply check-out, give the PC board a once-over, and when satisfied all is proper, apply power. The slug in the core of the ⅛" coil form of the TDA-7000 oscillator circuit will be adjusted first. You might want to enable/disable the mute line by connecting +5 V to the mute line 10k resistor. Connect a signal generator to the input of the IF amplifier receiver and find out where the device is tuned to. Once you have found the point where the receiver is operating, adjust the slug in the core to alignment at 30 MHz. If you can't obtain operation at 30 MHz, you might have to pad your coil with a capacitor on the bottom of the PC board to bring it to frequency. (I used a ⅛" adjustable coil form with 12 turns of #24 wire.) This adjustment is done with the varactor in place and the tune (RIT) control set to approximately mid-position. I used a 1N5141/1N5142 varactor, 12/15 pF respectively. Any similar low-capacitance varactor diode will work here.

Frequency Calibration

When the final frequency calibration is completed, you should obtain a signal that is full-quieting from about 5 μV. I do not have an FM generator, so I use a surplus URM-26 (AM generator) for check-out on my work bench. Operation of the S-meter circuit can be checked and calibrated with your signal generator for an indication of what μV sensitivity is indicated on the S-meter for future reference. You might want to connect your preamp for these measurements.

Gunn Safety

After the receiver is performing as needed, fire up the Gunn oscillator. A Gunn oscillator can be checked out without any complex instruments, to at least determine if it produces RF. One word of caution: Don't look into the open end of any waveguide system when it is radiating; the microwave radiation can injure your eyes. With low power devices, the safe distance is a few feet, but always use caution. Others might not know about the dangers. Safety first!

Again, it's easy to tell when a Gunn oscillator is oscillating. Connect a current meter in series with the power supply line and turn on the power. Preset the output voltage to about 5–6 volts, as the Gunn devices draw maximum current at very low voltages. With the normal Solfan 10 mW diode in place, use 9–10 volts. Wave your hand in front of the cavity opening and watch the current meter. This detunes the cavity and changes the operating point of the Gunn diode. It should affect the current being drawn. A crude method, yes, but it works on the bench, giving a quick indication of Gunn operation.

Gunn Diode Notes

Gunn devices draw maximum current at low voltages, so avoid these voltages. A Gunn's resistance does not read like a standard diode front-to-back ratio, but looks more like a 2–3Ω resistor. (Caution: Gunn diodes are voltage-polarity sensitive.) As the voltage slowly rises, a point is reached where oscillation starts. Further increase in voltage produces an increase in output, up to a point. Beyond this point (maximum RF output), increasing voltage produces a decrease in RF output. Going much above this point destroys the Gunn device. See the I/V curves in Figure 5.

Transmitter Operation

The transmitter (Gunn oscillator) connects to the Polaplexer detector mount, and the detector output connects to the input of the 30 MHz IF amplifier. If you use coax connectors to break the cables, use different types, or mark the coax cables to prevent supplying 10 volts to the mixer diode and destroying it. When powered up, you should see about 0.8 mA of current on the mixer diode when the injection screw is set for proper mixer injection. All that is required to use the system is another unit to put into full duplex 10 GHz operation.

In the Field

The Polaplexer/transceiver system has gone on countless outings, and performed very well. One advantage to the Polaplexer system is that you can quickly change—in just a few seconds—the polarization for either vertical or horizontal operation. Our organization, the San Diego Microwave Group, has settled on a vertical mode of operation.

On a recent DXpedition to a nearby hilltop, several transceivers were set up and many contacts made. Our Big Gunn system was in operation using narrowband SSB on 10.368 GHz, feeding to a traveling wave tube (TWT) and producing several watts of power on 10 GHz. Our group's best SSB DX contact to date is 174 miles. About 10 days later, Don WB6FWE on Mt. Pinos and Jack N6XQ on Mt. Soledad made contact using Solfan Gunn units and our transceiver board, for a wideband FM contact over the same SSB path—174 miles. I think that sets a record for Solfan use that will be hard to beat, considering the very modest units involved.

Parts Kit

I have a kit of new parts available with a PC board etched and ready for drilling. The parts kit includes the TDA-7000 chip, some Mylar™ capacitors, and the ferrite bead used in the audio circuit. I usually include a few other parts I have on hand as well. The basic kit cost with PC board is $10 postpaid. I will supply varactors, if needed, for $1 each. I also have a supply of high-output Gunn diodes providing 50 to about 100 mW at 10 GHz. Six and 18 GHz devices are also available. I test all devices prior to shipment and furnish specs. Cost of the Gunn diodes is $5 each; $10 each for premium devices with power out of 100 mW and up. I will be glad to answer any questions concerning this project or any other related microwave subject. For a prompt reply, include an SASE. Chuck WB6IGP, San Diego Microwave Group, 6345 Badger Lake Dr., San Diego CA 92119.

Component	Bandwidth		
	75 kHz	25 kHz	4.5 kHz
C8	3300 pF	0.01 μF	0.1 μF
C7	180 pF	500 pF	2200 pF
C9	330 pF	1000 pF	4700 μF
C10	3300 pF	0.01 μF	0.1 μF
C11	150 pF	470 pF	3300 pF
C14	330 pF	1000 pF	4700 pF
C15	220 pF	620 μF	3900 pF
Bypass			
C6	0.01 μF	0.1 μF	0.1 μF
C15	0.1 μF	1 μF	4.7 μF

Table 1. Values for changing bandwidth of TDA-7000. Compiled by WA6EXV.

A Mode B Ground Station for AMSAT's Phase III Satellites

Build your own station to track OSCAR 13!

by Timothy R. Kearney ND9T

Amateur satellite communications offers both a challenge and a reward to those who answer its call. The challenge is to construct a station which will locate, track and communicate through a satellite that is thousands of miles above the Earth. The reward can be finding other amateurs in Germany, India, Japan and Venezuela who have also accepted the challenge. I'll explain how to set up a "Mode B" satellite Earth station. Collecting the reward is up to you!

Satellite communicators have adopted their own language. For those of you just entering this arena, I have included a short list of definitions to help you understand some of the terminology in this article. See the "Glossary."

Table 1. Mode B Frequency Plan for OSCAR-10
(Frequency in MHz)

Uplink	Downlink
	145.987 Engineering Beacon
435.045	145.960
435.050	145.955
435.060	145.945
435.070	145.935
435.080	145.925
435.090	145.915
435.100	145.905
435.105	145.900 CENTER
435.110	145.895
435.120	145.885
435.130	145.875
435.140	145.865
435.150	145.855
435.160	145.845
	145.810 General Beacon

Table 2. Mode B Frequency Plan for OSCAR-13
(Frequency in MHz)

Uplink	Downlink
	145.985 Engineering Beacon
435.423	145.975
435.433	145.965
435.443	145.955
435.453	145.945
435.463	145.935
435.473	145.925
435.483	145.915
435.493	145.905
435.508	145.890 Center
435.513	145.885
435.523	145.875
435.533	145.865
435.543	145.855
435.553	145.845
435.563	145.835
435.573	145.825
	145.812 General Beacon

Building the Ground Station

A Mode B station is an achievable goal for many radio amateurs. Mode B describes a satellite system whose uplink signal is in the 70cm band (435 MHz) and whose downlink signal is in the 2m band (145 MHz). AMSAT OSCARs 7 and 10, as well as the latest Phase III satellite, AMSAT OSCAR 13 (AO-13), have Mode B transponders on board. Table 1 illustrates the frequencies used for uplink/downlink on OSCAR 10. Table 2 illustrates the frequencies for OSCAR 13.

The most important element of the ground station is the receiver. Lack of a good receive system can drive up costs by requiring greater antenna gain, transmit capability, and system complexity. After all, if you can't receive the satellite's signal, there's not much point in having the rest of the station! My advice is that you expend the greatest effort designing the receive link. (I don't mean to slight the transmit link—it too plays a key role in satellite communications.)

A successful Mode B station needs a good quality, low loss transmission line because of the attenuation or loss of signal energy experienced at 145 MHz and above. You'll also need aiming information to locate the satellite and steer the directional antennas. Finally, some understanding of the operating practices and schedule is necessary for effective satellite communications. I will outline each of these topics in some detail.

Receive and Transmit Antennas

Antennas for receiving and transmitting are a good place to start when describing a ground station installation. These antennas may vary from a monopole to a yagi to a parabolic dish. In all cases, the more gain or directivity that an antenna displays, the greater the need for an accurate mechanism to aim the antenna.

The receive link antenna for mode B should be optimized for operation near 145.9 MHz. AMSAT recommends a receive antenna with a gain of at least 10 dBi (10 dB gain over an

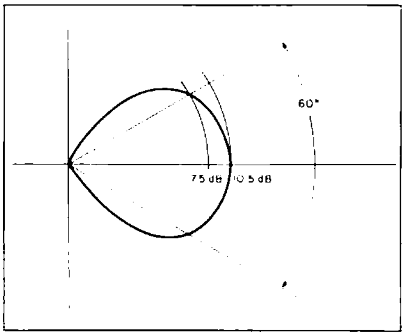


Figure 1. Antenna pattern in two dimensions. This antenna has 10.5 dBi gain and a half-power (−3 dB) beam width of 60 degrees.

GLOSSARY

AMSAT—Radio Amateur Satellite Corporation.
Apogee—The point of the orbit where the satellite is farthest from the geocenter of its orbit.
Azimuth—Angle in the local horizontal plane measured clockwise with respect to North.
Downlink—A radio link originating at a satellite and terminating at one or more ground stations.
Elevation—Angle above the local horizontal plane.
Inclination—The angle between the orbital plane of a satellite and the equatorial plane of the Earth.
Isotropic—A hypothetical source in free space that radiates equally in all directions.
Mode—The combination of transmit and receive frequencies used by a satellite's transponder.
Noise Figure (NF)—A figure of merit, measured in dB, describing noise performance.
Orbit—The path a satellite follows as it circles the Earth.
OSCAR—Orbiting Satelite Carrying Amateur Radio.
Perigee—The point of the orbit where the satellite is closest to the geocenter of its orbit.
Satellite pass—Segment of the orbit when a satellite "passes" within range of a ground station.
Uplink—A radio link originating on the Earth and directed at a spacecraft.

isotropic antenna). Several beam-type antennas (yagi, loop, helix, etc.) will satisfy that requirement. A beam antenna achieves its gain by directing or shaping the radiation pattern of the antenna. Figure 1 illustrates how an antenna directs its energy (in two dimensions). The antenna shown in Figure 1 has a gain of 10.5 dBi and a 3 dB (half power) beamwidth of 60 degrees. This antenna then provides 10.5 dBi gain in the direction in which it is aimed and 7.5 dBi (10.5–3) gain 30 degrees on either side of that direction. As you may have guessed, when gain or directivity increases, aiming the antenna becomes more critical.

Another concern with a satellite antenna is polarization. Radio waves consist of both electric and magnetic fields. Polarization refers to the way in which the electric wave varies in magnitude and direction at a given point in space. If the direction is constant and the magnitude is changing, we have linear polarization (LP) as with 2m FM (usually vertical) and 2m SSB (usually horizontal). If the magnitude is constant but the direction varies we have circular polarization (CP). Of course, there are two kinds of CP as well: clockwise rotation, called Right Hand Circular Polarization (RHCP), and counterclockwise rotation, called Left Hand Circular Polarization (LHCP). The circular polarization of these downlink signals is due to the satellite's own antenna polarization, the spinning of the satellite (spin modulation), and a phenomenon called Faraday Rotation. Because of these characteristics, AMSAT recommends an RHCP antenna for Mode B reception.

Two possibilities are the helix and the crossed yagi antennas. The helix may be the easiest to understand because its shape is circular (see Figure 2) like the impinging electric field. At 146 MHz a helix with 10 dBic is rather large (approximately 10 feet or 3 meters long and 26 inches or 0.67 meters in diameter). Also, helixes aren't readily available in the ham antenna marketplace. Homebrew is an alternative but the size won't change and the matching can be a challenge.

The second possibility, the crossed yagi, is sometimes called a "twist antenna." This antenna is a high-gain version of a turnstile or crossed dipole antenna. Simply stated, circular polarization is synthesized by feeding two dipoles (or driven elements) 90 degrees out of phase. Figure 3 illustrates two common phase-shifting methods. Crossed yagis are simply a pair of yagi antennas fed 90 degrees

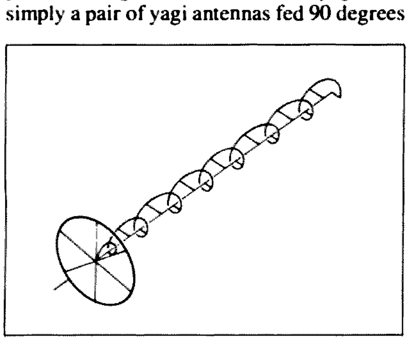


Figure 2. Helix antenna.

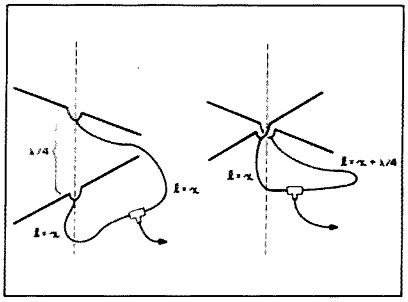


Figure 3. Two methods for achieving a 90-degree phase shift at the feed of an antenna to synthesize circular polarization. One method feeds both with the same phase but places the radiating elements ¼ wavelength apart. The other adds ¼ wavelength to the feedline to one of the elements.

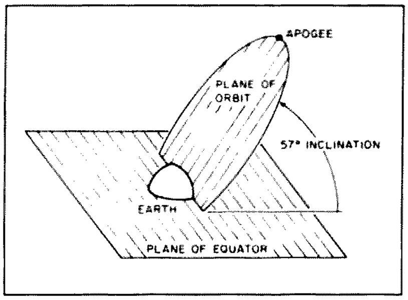


Figure 4. Elliptical orbit of Phase III C spacecraft, inclined 57 degrees.

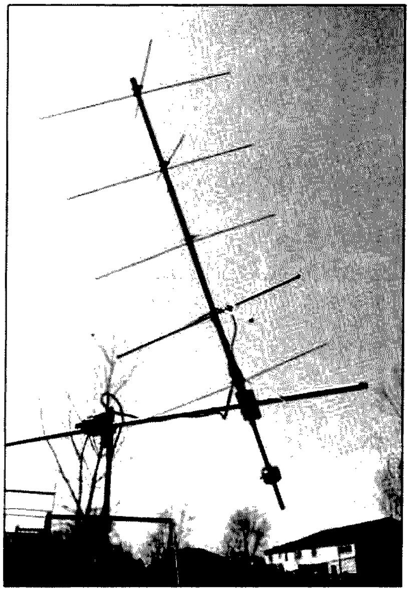


Photo A. 10-element crossed yagi antenna at ND9T. Note the counterbalance placed behind the antenna on an extended boom. This makes the job much easier for the elevation rotor.

out of phase. They can be on two separate booms or on a common boom, as in Photo A. Some manufacturers now provide a switch so that you can select either RHCP or LHCP. This is a nice plus, but not a requirement. As you can imagine, a 146 MHz CP antenna with

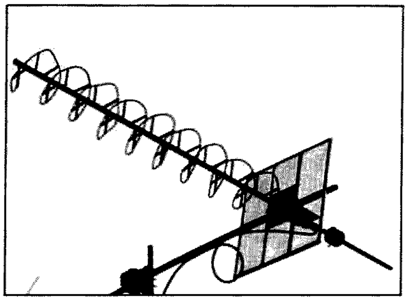


Photo B. Homebrew helix at ND9T. The 10 turns yield about 13 dB of gain. This antenna also uses a counterbalance.

10 dBi will have approximately 14 elements and have a boom length of 13 ft. (3.3 meters). When choosing the antenna, space and ability for satellite tracking must be considered. Photo A illustrates my 10-element crossed yagi with a counterbalance. Note that if a larger antenna is used, a nonconductive (like fiberglass) elevation boom should be used so as not to interfere with the performance of the antenna.

The transmit link antenna for Mode B should be optimized for operation near 435.5 MHz. For Phase III satellites, AMSAT recommends an uplink (transmit) Effective Isotropic Radiated Power (EIRP) of 21.5 dBW. That means 21.5 dB gain referenced to a 1 watt isotropic source. This translates to a 10 watt xmtr (10 dBW) and a 14 dB gain antenna, allowing for 2 dB of loss in the transmission line. A 14 dB gain UHF (435.5 MHz) antenna is neither difficult to get nor difficult to steer.

As with the receive antenna, the transmit antenna should be circularly polarized, RHCP, and switchable if possible. The circularity can be achieved in the same manner as at 146 MHz. The same principles of directivity also apply. Higher gain can be achieved with greater directivity and a narrower beam width. This in turn requires greater antenna aiming accuracy.

At these frequencies it's easier to construct a helix like the one shown in Photo B. This is a home-brew helix like those described in many publications (e.g., *Satellite Experimenter's Handbook*). The helix shown in Photo B has a counterbalance positioned behind the antenna to make the elevation rotor's job much easier.

Positioning the Antenna

You'll need a certain degree of antenna aiming accuracy because of the line-of-sight nature of VHF and UHF propagation and the directivity of the antennas described above. Just as in terrestrial communications, azimuth positioning is required. Additionally, because the satellite's position can vary from horizon to directly overhead (see Figure 4), elevation positioning is very desirable.

With the highly elliptical nature of the Phase III orbits, and because of the beam width of these antennas, the sophistication of the antenna positioning system can vary from quite simple (non-motorized) to computer-

aided. The easiest method requires a general knowledge of the satellite's position (relative to the Earth station). The antenna can be simply elevated and azimuth-positioned. The position may not need to be adjusted for several hours if the satellite is near apogee.

At the other end of system complexity, AMSAT (and others) offer some very accurate satellite tracking programs for personal computers. With interface circuitry these computers can automatically position a satellite tracking antenna system. This becomes very advantageous when tracking the fast moving, low polar orbiters like the space shuttle.

Photo C shows a very common system. A standard azimuth rotor and a simple TV rotor are used for satellite tracking. When constructing the antenna system, it's important to keep metal objects (like the boom) outside of the antenna array. The design shown in Photo C accomplishes this by placing the boom behind the antenna, possible because of the counterbalance. With larger arrays, this would not be possible and a fiberglass boom should be used.

Receive Station

To repeat: The receive link is the most important component in a satellite Earth station. Figure 5 is a block diagram of a satellite receiving station. As I mentioned earlier, an RHCP antenna with approximately 10 dBic gain is recommended. There are three other very important components: the preamp, the transmission line, and the receiver.

The receive preamp is the single best thing that can happen to a satellite receive station. The inclusion of the low-noise preamplifier helps to find the very weak signals that have traveled 22,000 miles (36,000 km) from the satellite to Earth. The performance of such a device is measured by its noise figure (NF) and gain. Gallium arsenide field-effect transistor (GaAsFET) amplifiers with 0.5 dB NF and 10 to 20 dB of gain are readily available.

Photo D shows the home-brew version for 145 MHz that I use at my station. Good commercial units cost from $80 to $250. The preamp is most effective when placed right at the antenna. (I'll explain the reason for the location later in this article.) The next element in the receive link is the transmission line. At 145 MHz, coaxial cable can exhibit significant attenuation, or loss of that very weak signal energy. Table 3 illustrates typical transmission line loss at both 145 MHz and 435 MHz. Use the lowest loss cable that you can get. At 145 MHz I use Belden 9913 and at 435 MHz I use half-inch Heliax™.

The final element in the link is the receiver. The receiver should be capable of SSB and CW reception and tunable across the desired 145.9 MHz band in 10 Hz steps. Many manufacturers offer all-mode transceivers at 145 MHz whose performance is adequate. Another alternative is a receive converter. This device converts the receive frequency down to 50 MHz or 28 MHz where a suitable receiver can be connected.

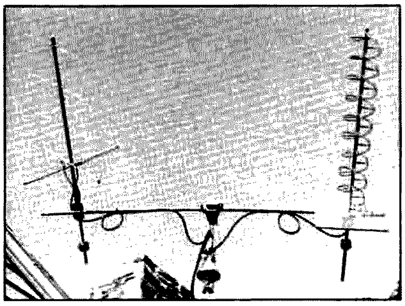


Photo C. Mode B antenna system at ND9T. Elevation rotor is a U-100 mounted on its side.

AMSAT recommends that the maximum effective noise temperature of the receive link be 625 degrees K, or a noise figure equal to 5.0 dB. The noise figure (NF) is a figure of merit. It is used as a measure of a receive system's ability to extract very weak signals (like satellite signals).

Earlier I mentioned noise figure, preamplifiers and transmission lines as being very important components of the receive link. The following example outlines the key role they play:

NF = Noise Figure = $10 \log_{10} F$

F = Numerical Ratio of NF = $10^{\left(\frac{NF}{10}\right)}$, F not in dB

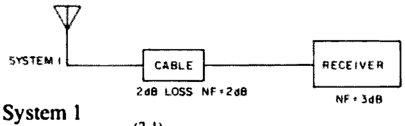
G = Numerical Gain, not in dB = $10^{\left(\frac{Gain}{10}\right)}$

Gain = $10 \log_{10} G$

Fs = System Noise Factor =

$$F_1 + \frac{(F_2-1)}{G_1} + \frac{(F_3-1)}{G_1 \times G_2} + \ldots$$

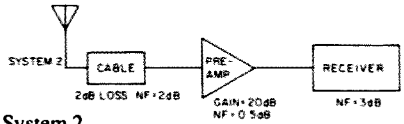
Element	Noise Factor (F)	Noise Figure (NF in dB)	G	Gain (in dB)
Coax	1.58	2 dB	0.63	−2 dB
Preamp	1.12	0.5 dB	100	20 dB
Receiver	2.00	3 dB	—	—



System 1

$Fs = 1.58 + \frac{(2-1)}{0.63} = 3.17$

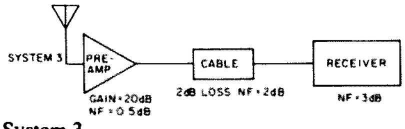
NF = 5.01 dB



System 2

$Fs = 1.58 + \frac{(1.12-1)}{0.63} + \frac{(2-1)}{(0.63 \times 100)} = 1.79$

NF = 2.52 dB



System 3

$Fs = 1.12 + (1.58-1)100 + \frac{(2-1)}{(100 \times 0.63)} = 1.14$

NF = 0.58 dB

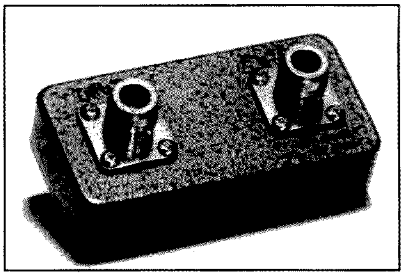


Photo D. Home-brew 145 MHz preamp at ND9T. This device has a measured gain of 24 dB and a noise figure of 0.43 dB.

Table 3. Cable Type and Loss

Loss in dB/100 Ft.	Cable Type			
	RG-8X	RG-213	9913	½" Haliax
@150 MHz	3.5 dB	2.3 dB	1.5 dB	0.9 dB
@450 MHz	6.8 dB	5.2 dB	2.7 dB	1.5 dB

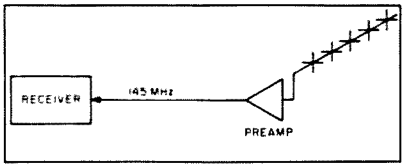


Figure 5. Receive link block diagram.

From the example it should be evident that the preamplifier can greatly improve the receive performance in weak signal reception. This example shows that a high gain, low-noise preamp placed at the antenna controls the receive link performance. Simply stated, a noise figure of 0.58 dB is better than a noise figure of 5 dB. But what does that mean to you as a listener? To better understand, let's look at the equation that relates the strength of the receive signal (Sr), the signal-to-noise ratio (SNR), the noise power of the receive system (No) and the noise figure (NF).

Sr = NF + No + SNR

The ratio of the output signal power to the noise power (SNR) is what we hear. 10 dB is a good number. The noise power in the system (No = kTB) can be considered a constant for our purposes. What we have to work with, then, are the receive signal power (Sr) and the noise figure (NF). If we can improve the NF from 5.01 dB to 0.58 dB, a 4.43 dB improvement, the input power can drop by 4.43 dB and the SNR will not change. That means that the receive signal could drop by a factor of almost three ($2.77 = 10^{.443}$) and the operator would not notice any difference in the signal quality. So, both inclusion of a preamp (preferably at the antenna) and use of low loss cable is quite important in a satellite receive link.

Transmit Station

Once the receive link is complete the next major hurdle is the transmitter. The Mode B uplink signals are in the 435.425 MHz to

435.575 MHz band (OSCAR 13). AMSAT recommends an uplink signal EIRP of 21.5 dBW. This equates to a 20 W transmitter, 2 dB loss in cable and an 11 dBic gain antenna (13 dBW − 2 dB + 11 dB = 22 dBW). If you choose an 11 dBic antenna and very low loss transmission cable (like Heliax), you can get the desired EIRP with a 20 W transmitter.

As with the 145 MHz receiver, there are many commercially available UHF transmitters. They should be capable of SSB and CW transmission with from 10 W to 100 W output. An alternate method of signal generation is a transverter. This device converts a modulated (SSB or CW) low frequency signal to the desired UHF band. Photo E shows such a device in use at my station. An all-mode transceiver (IC-740) generates the SSB signal at 28 MHz. A low power (100 mW) output is provided on the back of the transceiver that drives the transverter. This device (Microwave Modules MM435-28S) up-converts the low level signal to 435 MHz and amplifies it, providing a 10 W output. You can also use a power amplifier to augment a low power transmitter, if that's what you want or need. Figure 6 shows a block diagram of my transmit station.

The output power from the satellite is divided among all the using stations. AMSAT and all conscientious satellite users recommend using as little transmit power as possible to maintain the communication link. While monitoring your downlink signal, adjust the uplink power level so that it is no stronger than the satellite's beacon transmitter.

Locating the Satellite

A crucial part of successful satellite communication is locating the satellite. The more directive (higher gain) the antenna, the more critical the aiming. A typical TVRO dish antenna (receiving a 4 GHz signal) needs to be within a degree or so of the proper aiming angle, elevation and azimuth. The typical 10 dBic Phase III (AO-13) antenna will have a half-power beamwidth (−3 dB) of 60 degrees. Aiming this type of antenna is far less critical.

An elevation/azimuth tracking antenna system is best for Phase III reception. This system can be manual because of the relatively slow movement of a satellite at the apogee of a highly elliptical orbit. Low orbiting satellites, like the Russian satellites or the space shuttle or the new MicroSATS, usually require a motorized system.

Where is the satellite? OSCAR 13 will go as high as 22,000 miles (36,000 km) above the Earth in an orbital plan inclined at 57 degrees. (See Figure 4.) The easiest method for satellite location is a tracking program for a personal computer. These are readily available from AMSAT for quite a variety of computers. Given the user's station location and updated information on the satellite's orbit, called orbital elements, these programs compute the aiming angle for the antenna at any given time. Some even show a map of the Earth with the satellite's path plotted. In the event that computers aren't available, you can tune your receiver to the satellite's beacon signal, elevate the antenna to 45 degrees, and sweep the south looking for the strongest signal.

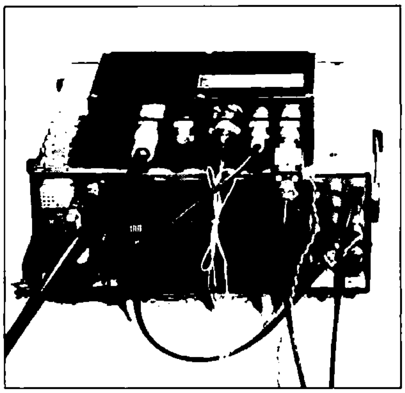


Photo E. Microwave Modules UHF transverter and HF radio used at ND9T. Most modern day transceivers are readily interconnected to a transverter.

Another (older) method is to use an OSCARLOCATOR. This is a graphical plotter available from AMSAT and the ARRL.

"The easiest method for satellite location is a tracking program for a personal computer."

Operating a Mode B Station

Once the antennas are aimed, and the station is on the air, the next step is operation. AMSAT regularly publishes information on the satellite's operating schedules. The schedule depends on the satellite's position (sun angle, antenna angle, etc.), battery voltage and many other parameters monitored by AMSAT. When these conditions are favorable and the transponder of interest is in operation, you can begin your search for the satellite signals.

First, find the beacon signal (145.810 MHz for AO-10, 145.812 MHz for AO-13). Set the uplink transmitter to the desired frequency and the downlink to the expected receive frequency. (See Tables 1 and 2.) Note that the uplink/downlink signals are inverted (LSB becomes USB) by the satellite. Begin by transmitting a string of dots (CW) and vary the receive frequency until you can hear the downlink. It can be delayed by almost a quarter of a second because of the extreme distance the signal must travel. Listening to the uplink and delayed downlink can be quite distracting!

Once you locate the signal, you can switch to SSB or continue CW. Because of the time delay I do not continuously monitor the downlink signal once it has been located. The signal may vary in frequency by a few kilohertz because the movement of the satellite causes a Doppler shift in frequency. Because of the tumbling of the satellite, signal rotation and atmospheric conditions there may cause amplitude variations in the signals. Once the operator becomes accustomed to these phenomena, QSOs become routine. Conversation can vary from a few moments to a few hours with these satellites. Chances are you will discuss how your new acquaintance went about building his or her Mode B station. Satellite QSOs are lots of fun!

Where to Get More Info

This article presents the basics of a Mode B Earth station for Phase III satellite communications. Topics on antennas, receive and transmit links, satellite locating and operating have been covered to give you some idea as to how to assemble a Mode B station. If you need more information, use the references provided below. AMSAT satellite information updates are also given regularly on W1AW and on the AMSAT Tuesday evening net (2100 local) at 3.842 MHz and on Sunday afternoon (1900 GMT) at 14.282 MHz. You can also write AMSAT at PO Box 27, Washington, D.C. 20044 or call at (301) 589-6062. Hope to see you on OSCAR soon!

References:

Davidoff, Martin R., *The Satellite Experimenter's Handbook*, ARRL.

The ARRL Antenna Book, ARRL.

The ARRL Handbook, ARRL.

AMSAT, Box 27, Washington D.C. 20044.

ARRL, 225 Main Street, Newington CT 06111.

Timothy R. Kearney ND9T was first licensed in 1966 (at age 14). He has a bachelor's degree from Notre Dame University and a master's degree from Purdue University, both in electrical enginering. He has taught at Purdue, worked at Scientific Atlanta where he co-authored a book entitled Introduction to Satellite TV. *ND9T currently manages a development group at Magnavox. He has been an AMSAT member since 1972 and has served as an Area Coordinator in Georgia and currently in Indiana. Contact him at 6421 Wayoata Court, Fort Wayne IN 46815.*

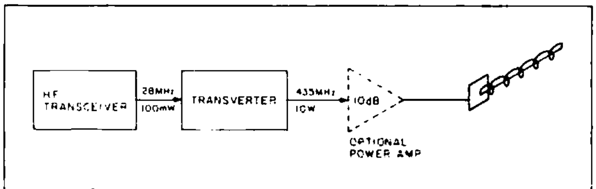


Figure 6. Transmit link block diagram.

Number 10 on your Feedback card

73 Book Review

by Larry R. Antonuk WB9RRT

Elements of Microwave Electronics Technology

A microwave text for hams at all levels.

Elements of Microwave Electronics Technology
by Joseph J. Carr, Copyright 1989
Harcourt Brace Jovanovich, Inc.
1250 Sixth Avenue
San Diego CA 92101
Hardcover Price: $31.00

Does microwave electronics look to you like a confusing mixture of feed horns, dish antennas, plumbing fixtures and voodoo? Or, are you one of the brave souls who just plunged into microwave communications and found it to be an exciting segment of ham radio activity?

Whatever your level of experience, there comes a time when a little education can go a long way. A timid beginner needs to know a few of the pitfalls before he starts; a seasoned experimenter may want to round out his practical experience with some theory. The choice of the proper book can make or break a learning experience.

Between "Too General" and "Too Specific"

For the most part, existing material on microwave electronics falls into one of two categories. You can often find information in a short chapter at the back of communications books. This is usually much too general in nature. You can also find books dedicated to microwave electronics. These books target too specific a subject area, or they require an MSEE to get beyond the preface.

The answer to this dilemma has just been published. Written by Joe Carr, a friendly name to readers of electronics books, the *Elements of Microwave Electronics Technology* is a complete discussion of microwave communications technology. This manual takes the reader from a history of microwave development through transmission lines, wave guides, filters, antennas, and the use of the Smith Chart. A history of early microwave RF power generators leads into several chapters on microwave active devices—tubes, transistors, diodes, hybrid and monolithic ICs, and the uses of these devices in amplifier circuits. It also covers transmitters and receivers, and wraps up with a discussion on radar systems and communications systems.

The best thing about *Elements of Microwave Electronics Technology* is that it's a textbook. While this might bring back unpleasant memories for some readers, it really means that we're talking about a quality book. The graphics are top-notch. The text is readable, and broken into easily digestible sections. Each section begins with the chapter objectives and a pre-quiz. After each chapter there's a summary and recapitulation, followed by questions and problems (the ol' tell-'em-what-you'll-tell-'em/tell-'em/tell-'em-what-you-told-'em method). In short, a solid method to learn whatever it is that you need to know about microwave electronics.

Home-brew hams should be forewarned that, because it is a textbook, this book deals with practical problems and solutions and totally avoids the nuts-and-bolts side of things. There are no "Build a 24 GHz Transmitter from a Radar Detector and a Soup Can" chapters here. But for the home-brewer who needs to know a little more precisely why things work, or just for the curious beginner, *Elements of Microwave Electronics Technology* is a wise investment. 73

Larry Antonuk WB9RRT has written numerous reviews on test equipment and electronics books. He currently works as a project manager for a land mobile service shop in Keene, New Hampshire. He enjoys home-brew projects, experimentation, and instrumentation. Contact him at P.O. Box 452, Marlborough NH 03455.

73 Review

by Bill Clarke WA4BLC

Master of CW

The MFJ-486 Grandmaster Memory Keyer

MFJ Enterprises, Inc.
P.O. Box 494
Mississippi State MS 39762
Phone: (800) 647-1800
Price Class: $190;
MFJ-1312 AC adapter, $13;
MFJ-77 Remote Control Keypad, $20.

By now everyone is pretty familiar with automatic keyers. They are the little electronic devices that allow us to send nearly perfect CW with a minimum of effort using a paddle (straight or iambic) as a key. Most keyers offer some variable controls for customizing dit and/or dah weight, and a few offer various memory schemes. Memories provide a means of recording repetitious messages (CQs, QTH, station info, UR RST IS, etc.) for later transmission, usually at the push of a single button.

The MFJ-486 Grandmaster Memory Keyer does all of the above, then enters the next dimension of automatic keyers—the MFJ CW Word Processor™. CW word processing is as close to having a computerized CW station as you can get without actually having a computer (and all that goes with it: large size, display, keyboard, RF noise, etc.). The Grandmaster is only 9"W x 2.5"H x 6"D and weighs less than a pound.

Features

Before getting into the complexities of the Grandmaster let's look at some of its features:

- •Works with grid block, cathode, and direct keying.
- •Headphone jack for private listening.
- •Has provisions for external control (MFJ-77 Remote Control Keypad).
- •Adjustable speed from 4–100 wpm.
- •Adjustable weight.
- •Variable tone and volume.
- •10 message memories.
- •Automatic contest number generation.
- •Random code generator.

MFJ has placed a warning at the top of the first page of the operating instructions. It states, "PLEASE READ THIS ENTIRE MANUAL BEFORE OPERATING THIS EQUIPMENT!" This is no idle warning, since without a complete understanding of all the controls and features on the Grandmaster, you will be unable to make it work to its fullest capabilities.

The manual is not fancy, being only copies of typewritten text. However, it is effective in getting the necessary information across to the reader.

Message Memories

The 10 message memories provide a total of 8000 character spaces. To illustrate the total size of this memory: A full column of 73 text (from the top of the page to the bottom) contains about 3500 characters. The memories are soft partitioned, meaning they are not of fixed size, and have a lithium battery backup.

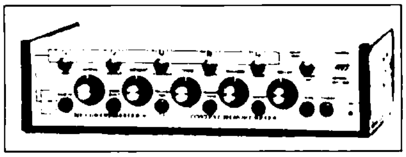


Photo A. MFJ-486 Grandmaster Memory Keyer (courtesy of MFJ). A complete neophyte can master code and become a formidable contester with this device.

You can use either straight or iambic paddles with the Grandmaster. The sending speed is adjustable from a front panel potentiometer with a programmable speed range. The latter functions similar to "band spread" or slow tuning by setting the top and bottom speeds of the desired range on a 1:5 basis. For example, the slowest range is 4–20 wpm and the fastest is 20–100 wpm.

"...the quick operation of the memories and placement of the incremental serial number will no doubt raise scores and make contesting easier and less rushed."

CW Word Processing

Have you ever entered a lengthy message into your keyer's memory, only to mess something up at the very end? Or, do you have a canned message that is no longer up-to-date due to an equipment or antenna change? With the MFJ CW Word Processor you can insert, delete, and otherwise edit your messages in very much the same way that a typist does on a word processor.

Memory editing is done one "word" at a time. As each word in the memory is sent out for edit, you can either change or delete it, insert additional text, or accept it and have the next word sent.

My Use of the Grandmaster

Memory messages can include automatically incremented serial numbering for contests, repeal messages (CQs and beaconing), and normal memory messages like callsigns, QTH, station info, etc. With the large amount of memory available in the Grandmaster, I felt like a piker for using such a small amount for my test messages.

The memories are in two banks, A and E. I set up my memory messages as follows:

A1–CQ CQ CO DE WA4BLC CQ CQ CO DE WA4BLC CQ CQ CQ DE WA4BLC K
A2–DE WA4BLC K
A3–TNX FOR CALL. NAME & QTH. UR RST IS (you hand-send this)
A4–STATION, EQUIPMENT, AND ANTENNA INFORMATION
A5–stores the current E5 for resending in E3
E1–CQ SS CQ SS DE WA4BLC
E2–NR (add in memory E5) A WA4BLC 68 VA K
E3–NR (add in memory A5) A WA4BLC 68 VA K
E4–QSL UR NR (hand key this)
E5–automatically increments numbers that are called in E2

As you can see, I have set each bank for a specific use, one for normal contacts and the other for sweepstakes. They can be customized in any fashion for nearly any use. The one limitation on memory usage is A5 and E5 which are reserved to hold only four digit numbers, the latter incrementing after each use.

Memories may be embedded into one another, as I did in E2 and E3. E2 calls the next incremental number from memory E5 to be sent. E3 is used in case the message needs to be resent and will not cause the number to increment.

Of course, this could all be changed. For example, one message could hold signal reports: UR RPT IS (hand key this) or you could put in UR RPT IS 599.(All signals are 599, aren't they?)

For the contest operator, the quick operation of the memories and placement of the incremental serial number will no doubt raise scores and make contesting easier and less rushed. Use of the Remote Control Keypad makes contacts go even quicker by placing the memory controls in your hand.

Although you can make a normal contact easier by using the memories for canned information (QTH, name, station info, etc.), I wonder if something is lost in the quintessence of the contact. I often feel we have progressed to the point where personality is being removed

from our contacts. This is one reason I am not active on packet. Oh well, I guess I'm just old-fashioned.

Code Course

Did anyone notice that last entry on the list of features? It refers to the random code generator, which is a complete three-step CW course. This means a neophyte could purchase the Grandmaster, use it to master the code, then go on to be a contest champion, all with the same device.

The MFJ-486's code course comes in three logically designed steps. The first teaches letters and punctuation by sending random characters in groups of five.

The second step sends mixed random characters in assorted groups up to eight characters long.

The last step of the code course is an infinite number of random QSOs sent in the same general format as you will find on VE exams.

The Farnsworth method is included as an option, along with answer-replay features for checking the accuracy of your copy.

For the student of CW, working to master Mr. Morse's curse, the Grandmaster's built-in CW course is perfect, particularly the practice QSOs.

Room for Improvement

The Grandmaster is a very sophisticated—that is, complicated—device. To get the most from it, you have to use it constantly to stay in practice with all its capabilities.

The MFJ-77 Remote Control Keypad is too light, and slides around on the desk. Additionally, the control's cable is too stiff, compounding the keypad's resistance to staying put.

There is no specific means for speed control when using the code course option. The student is left to his own devices. I do note, however, that one way of setting the default to 20 wpm is to turn the speed control fully counter clockwise and press the SPEED SET switch. Set in this manner, the slowest speed in the range is 4 wpm. Using the 5:1 ratio of the speed control, the fastest would be 20 wpm.

In the Future

I cannot help but wonder if there is a Grandmaster Memory Voicer in the works. Such a device would use digitized voice memory for messages, with features otherwise similar to the CW keyer.

Warranty

The Grandmaster comes with MFJ's *One Full Year No Matter What™* guarantee. This means MFJ will fix your Grandmaster for one year no matter what happens to it. This is the kind of service customers want; other manufacturers should take note.

The MFJ-486 Grandmaster Memory Keyer is available from many amateur dealers around the world, as well as from MFJ Enterprises, Inc., at the above address. ■

Bill Clarke WA4BLC, research and aviation writer, has written many reviews for 73. You may reach him at PO Box 2403, Falls Church VA 22042-0403.

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73 Review

by Dave Buren N2GE

Command Technologies "Commander" HF-2500

A '90s generation linear amplifier!

Command Technologies, Inc.
1117 West High Street
PO Box 939
Bryan OH 43506
(800) 736-0443
Price Class: $2200

We're in the space age—high-tech supermolypermaloy this and avalanche-clamped high dv/dt MOSFET that. Hypersil shrunk the transformer; Eimac shrunk the "jug." Electrolytic capacitor technology, utilizing micro-etching and polysyllabic electrolytes, has decreased size to the point where you can hold a farad of capacitance in one hand. The days of the seven-foot-high rack amplifier with link-coupled output, mercury vapor rectifiers, and multiple 813s are gone for good. Swinging chokes, bigger than most plate transformers today, and banks of can capacitors with porcelain-insulated terminals are but a memory. The stage has been set for the '90s generation of linears.

The latest desktop entry, Command Technologies' Commander HF-2500, uses a pair of 3CX800A7s and fits squarely alongside the Titan and the Alpha in power and size. It operates class AB2 and achieves 1500 watts output without much effort.

The First Encounter

If you're like I am, the first thing you do with a new piece of equipment is open'er up, take a whiff of the new electronics smell, and check out the hardware. These are some of the most exciting few minutes of new ownership.

Just take the HF-2500 out of its carton, place it on the bench, and it's ready to go! The tubes and the transformer are factory-installed. It's 220 VAC only—just add a power plug to mate your particular installation. Like black body cameras and 200 watt stereo amps, this unit was all black, with red trim and lettering and a white illuminated single meter. Not a bad first impression.

The Commander has a special hex socket type of flat head screw called a button-head. It's almost as if the manufacturer wishes you wouldn't open it up. But, if you want to convert the Commander to 10 and 12 meters, you gotta.

I popped open the lid and shone a good bench light down into the top. The first thing to catch my eye was the tank circuit and bandswitch. All the contacts are "coin silver" plated, and the switch is super heavy duty. The feel of changing bands and the resounding clack of the detent attest to this! The tank coil also has a thick silver plate, as do all of the interconnecting tap straps and parasitic suppressors.

Something was different here, though! Buried down under the plate tuning cap was a huge ferrite toroid with taps. This is the 160-80-40 meter portion of the pi-output. A design Q of 14 with the toroid does an amazing shrink job of the pi-output. The size is further reduced by matching from plate load impedance of 1400 ohms down to 200 ohms and then utilizing a 4:1 reactance-tuned ferrite to get the rest of the way down to 50 ohms. As long as you avoid saturation this sure makes for a tight, compact box. Judging from the size of the toroids, saturation is not a problem. The plate transformer weighs 35 lbs. and accounts for half the total weight of the unit. It has a continuous commercial service rating of 1.6 amps. But wait a minute . . . where are the filter caps and diodes?

The answer to this question wasn't immediately apparent. A check of the schematic indicated a conventional full-wave voltage doubler circuit delivering 2650 VDC. The caps are 220 uF, 450V jobs in doubler series for an effective 27.5 uF. So, back to the visual inspection. Tracing the secondary HV wires from the transformer, I discovered that the caps and the diodes reside in the airstream inside the pressurized containment underneath the tube sockets. That's good news for the caps because heat is the worst enemy of electrolytics. Pressurized cooling is delivered by a 50 C.F.M. Dayton squirrel-cage blower which is located on the cool side of the chassis.

Band Coverage

All the HF bands, 160 through 10 meters, worked successfully. Tune-up was quick and simple: the normal iterative tune, load, drive adjust and plate current dip while observing the wattmeter for maximum output. The 3cx800's require only 50 to 80 watts nominal drive to reach full legal power. This is sure a change for me—not having the power level pot cranked all the way clockwise.

When you reach the 1500 watt output level adjust the load control for 90 mA of grid current or less. The 3-position multimeter covers plate voltage and current and grid current.

Once tuned up, I found that I tended to leave the meter in the IG position. It's a snappy meter movement and gives a good indication of instantaneous peak current. The 12 meter band is loaded with the bandswitch In the 10m band position, 17m in the 15m position, and 30m in the 40m position. WARC positions on the bandswitch would have been nice here. The problem lies in the tuned input because there seems to be plenty of range in the pi-output. The manufacturer admits that the unit will operate on the WARC bands at reduced power, or at full power "with an easy adjustment to the tuned input circuitry," implying that you will now operate at reduced power on the corresponding non-WARC band. There might be a compromise position for both bands but I sidestepped the problem entirely by adding a Johnson Matchbox between my solid-state rig and the linear input. This is something I got into the habit of doing with my home-brew 4 x 1, which doesn't have tuned input or bandswitch—just a big roller inductor.

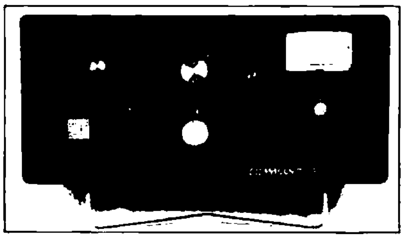
Incidentally, I wish I could tell you how easy and convenient the conversion to 10 meters really is. If you supply a copy of your license, Command Technologies will give you instructions to activate 10 and 12 meters.

The HF-2500 uses an adjustable L-C-L (T-Match) tuned input network for each of the non-WARC amateur bands. A slot screwdriver or tuning stick adjustment from the rear panel will let the solid-state rig look into a clean 1:1 VSWR. There is also an adjustment for the ALC.

Operating

I don't need to expound upon the assets of an extra 10 or 12 dB of gain into a good antenna system. I found the HF-2500 to be responsive and clean. Reports all verified that the signal was splatter-free and clean, including Fr. Moran 9N1MM who came back on my first call.

Dave Buren N2GE is a Principal Electrical Engineer at Markem Corp. in Keene, New Hampshire. He specializes in hardware design and motion control. He has a B.S in math and a B.S.E.E. Dave also works as a station engineer at a commercial FM radio station in Peterborough, New Hampshire. He has been a ham since 1954, and could care less how many countries he's worked toward DXCC. He also enjoys mountain climbing. You can reach him at 357 Middle Hancock Rd., Peterborough NH 03458.



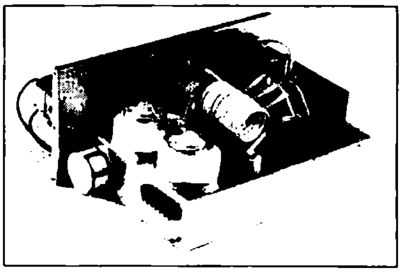


Photo A. The Commander HF-2500 front . . .
Photo B. . . . and rear.

Build The Banker

A convenient memory bank selector for the TS-940S.

by Michael Jay Geier KB1UM

The TS-940S is one of the finest HF rigs available today, but it has one major deficiency: the location of the memory bank selection switch. There are four banks of ten memories (for a total of 40) but the bank selection switch is located under a cover on top of the radio, along with some seldom-used controls like the VOX gain. It's an inconvenient location so most of us just use one bank and ignore the rest.

This project shows you how to build a simple circuit that can be installed in place of the optional voice synthesizer board—you won't need to modify the radio. The completed project will allow you to select memory banks using the VOICE button on the front panel.

About the Circuit

The bank switch in the '940 operates in an "active low" binary sequence: It is wired to short to ground two lines coming from the radio's digital control system. The sequence is:

Bank 4: HH
Bank 3: HL
Bank 2: LH
Bank 4: LL

Thus, when the switch is set to Bank 4, it is an open circuit and effectively disappears.

The bank selector circuit intercepts the command generated when you press the VOICE button and increments a 2-bit binary counter, generating logic 0s (zero volts or "L") in the same sequence as the switch. After passing through the diodes, which prevents logic 1s (5 volts) from damaging other circuits, the signals are coupled in parallel with the switch through the four-pin connector on the right side of switch unit F (the black

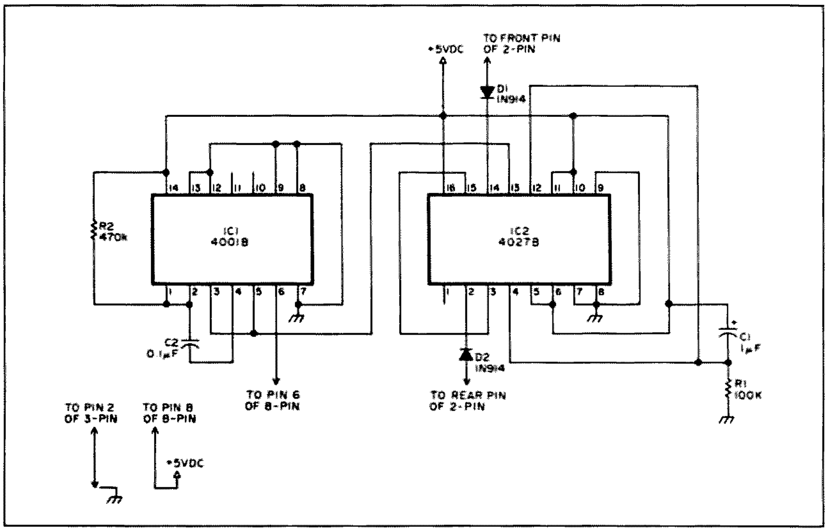


Figure 1. Schematic diagram for "The Banker." Power supply: 5VDC, supplied by TS-940S. Circuit type: CMOS, sequential switching. Input: Voice synth. start signal from TS-940S. Outputs: Active low to ground, binary coded. Backup power: None.

Parts List

Device	Value/Type	Available At:
IC1	4001B	Jameco, Digi-Key, Radio Shack (Catalog #276-2401)
IC2	4027B	Jameco, Digi-Key
R1	100K	
R2	470K	
C1	1µF	
C2	0.1µF	
D1	1N914 type	
D2	1N914 type	

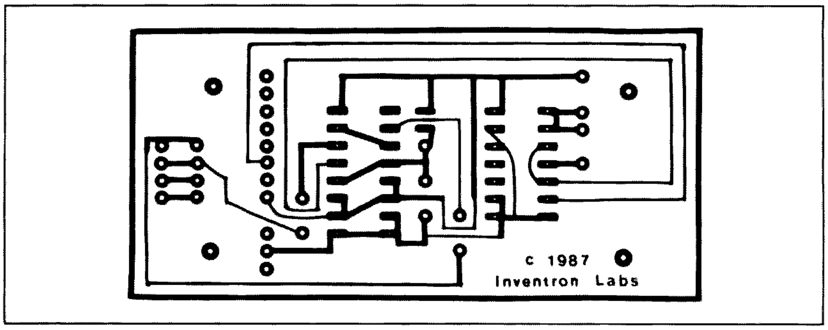


Figure 2. Foil pattern.

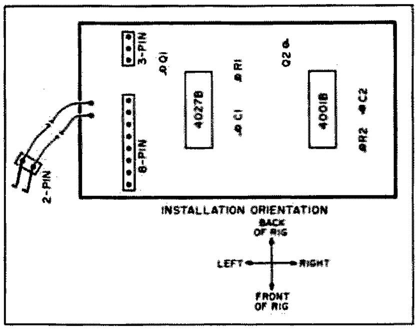


Figure 3. Installation orientation.

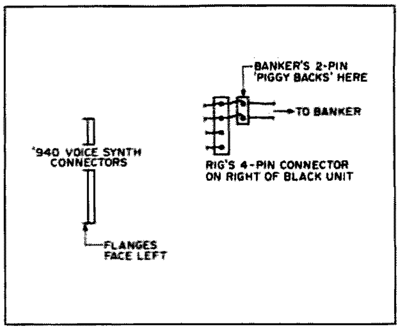


Figure 4. Flanges face left.

unit containing the bank switch). As long as the switch remains in Bank 4, the selector can pull the appropriate lines low and step through the banks.

The signals intended for the voice synthesizer are narrow and rapid, and vary depending upon the frequency to be spoken. They occur in a burst each time you press the VOICE button so some input signal conditioning is required to prevent false or unreliable triggering of the selector circuit.

In the schematic diagram in Figure 1 IC1, a 4001B quad NOR gate operates as a monostable multivibrator, or "one shot". The first pulse, applied to pin 6, fires the one-shot (with R2 and C2 providing the time constant) that remains triggered for the duration of the burst. The result is a single pulse of several milliseconds, suitable for triggering IC2.

IC2 is a 4027B dual JK flip-flop, used as a 2-bit binary counter. C1 and R1 provide a reset pulse when the rig is first turned on, setting the flip-flop's two NOT-Q outputs to the logic 1 state. Each pulse from IC1, corresponding to a press of the VOICE button, advances the count one step in its binary sequence. Diodes D1 and D2 permit the flip-flop to pull the radio's bank switch lines low, but block logic 1 voltages (5 volts) from reaching the radio.

Construction Details

Figure 2 shows a full-sized foil pattern, but any type of construction will do. The board should be made to the same overall dimensions, though, so that it will fit in the space intended for the voice board.

The radio's connectors are on standard 0.1-inch centers, but the matching sockets are simply not available in the U.S., as far as I can tell. Usable connectors can be made from standard male 0.25-inch high "header" type pins, available from Jameco Electronics and Digi-Key. The pins are a little slim, though, so bend them just a little to insure a good connection. The 2-pin connector should be attached to the selector board by about 5 inches of 2-conductor wire, and can be made from the same type pins, bent at a right angle. You can also use a right-angle header. Lay the board solder side down so that the two rows of four holes are facing left, and lay the wire assembly to the left of the board, with the pins facing up. Now, connect the wires to the two outermost holes nearest the front of the board, making sure there are no twists in the wire. (See Figure 3.)

When installing C1, D1 and D2, be sure to observe proper polarity. And, of course, be careful that the ICs are correctly inserted.

Installation and Operation

Disconnect power from the rig and install the board, with the connectors on the left, and screw it down with two screws. (See Figure 3.) Now, locate the radio's two connectors, which will be lying near the installation location. (If you're not sure where to install the board, see page 44, section 9-5, of the owner's manual.) Install the 8-pin connector with its flanges facing left, and the 3-pin one the same way. Finally, take the selector's 2-pin and press it into the top of the REAR two pins of the four-pin on the right of switch unit F (just to the left of the installation site), gently pulling the existing wires to the left in order to make room for entry. See Figure 4 for connector details.

Close the rig up, reconnect power, set the bank switch to Bank 4, and fire it up. Press the SCROLL button until the LCD displays a memory location. The first number should be 4, indicating Bank 4. Press the voice switch, and it should move to Bank 1. Each press will increment it by one. If the order is incorrect, you may have wired the selector's 2-pin backwards. The easiest way to correct it is to reverse the wires going to the board, and leave the connector alone. Be sure to completely remove it from the radio first, to avoid any potential static problems or short circuits.

A Bonus

The selector resets to Bank 4 upon power up, effectively making it disappear. The bank switch still works and can be used to preset the rig to a specific bank for timer recording of shortwave broadcasts. Don't forget, though, to set it back to Bank 4 for normal operation. If you leave it in another bank the banks won't step properly, but no damage will be done. Just reset the switch and all will be fine. Enjoy the other 30 memories in your '940!

Michael Jay Geier KB1UM invented the Memory Bank Selector in 1986. It was marketed by Inventron Labs as "The Banker" in 1987. KB1UM is 73's troubleshooting "Ask Kaboom" columnist. You can reach him at PO Box 64766, S. Burlington VT 05406.

Number 15 on your Feedback card

LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Avenue
Saugus CA 91350

The Dawn of the New Decade

No-code is on its way, but Novice and Tech may be on their way out! The Commission is proposing to amend its rules by establishing a codeless class of amateur operator license to be called the "Communicator Class." The long-awaited action on no-code came the morning of February 8, with many surprises, including the eventual abolition of two license classes by attrition.

Under the FCC proposal in P.R. Docket 90-55, the Communicator Class would be incorporated into a simplified licensing structure containing four ascending steps: Communicator, General, Advanced, and Amateur Extra classes. Current Technician and Novice Class operator licenses would be grandfathered indefinitely, renewable and modifiable, but no new licenses would be issued for those license classes.

The codeless operator class license would satisfy three major objectives. The first is to offer an entry level license for all persons who find telegraphy a barrier to joining the amateur radio service. The second objective is to design a codeless license that can easily be incorporated into the current licensing process. The third objective is to avoid any negative effect upon current licensees, the volunteer examiners who administer amateur examinations, or the Commission's workload.

According to the Commission, the Amateur Radio Service exists for the purpose of self-training, communication and experimentation by duly authorized persons interested in radio technique, and whose aim is solely personal, without financial gain.

Upgrading from Communicator

Until now, individuals seeking a license to operate an amateur station must prove that they can send correctly by hand, and receive correctly by ear, text in Morse code signals. Although this requirement may be waived for an operator of an amateur station transmitting only on frequencies above 30 MHz, each of the five current classes of operator licenses issued by the Commission requires the applicant to pass a Morse code examination.

Although the Communicator Class operator license would not require knowledge of Morse code, a Communicator Class licensee who passes or receives credit for a telegraphy examination would receive the privileges of the Technician Class. Upgraded Communicators would be required to sign "/AC" after their call. The upgrade from Communicator to Communicator/AC would be handled totally by the VECs. No new license or callsign would be given, and no FCC action would be taken.

The FCC staff could not explain why a code test was chosen as the means to obtain added VHF privileges, other than to state that that was what the ARRL wanted.

Communicator Class Privileges

Privileges for the Communicator Class would include all emission types, replace two existing beginner operator classes, and simplify the amateur operator license structure.

The Commission would require applicants for the Communicator Class license to pass a 60-question written examination. The new question pool would be comprised of the questions from the two pools currently used in the Novice and Technician license examinations, along with some additional material. The Communicator class test itself will consist of 30 questions from the Novice question pool, 25 from the Technician question pool, and five newly-created questions.

Candidates for a Communicator license would be tested through the volunteer examiner program. Since the Communicator class will replace the Novice class license, this would automatically bring all amateur radio testing under the VEC program.

The proposed transmitter power for the Communicator class would be 200 watts PEP. The licensee's station would be eligible for a Group D callsign. Stations with Communicator class control operators would not be permitted to transmit on the 2 meter or six meter VHF bands, or on the HF bands.

Feedback Requested

First, the Commission is requesting comments on all aspects of this proposal, with emphasis on the effect of excluding Communicator class licensees from the two VHF bands. Second, any comments are welcome on whether it's desirable to allow Communicator class licensees to operate on-the-air telegraphy on the HF bands. Any HF privileges that the final report and order might grant to Communicator licensees would be limited to domestic communications only, so as to stay within the terms of the WARC treaty. No cross-border or out-of-continent contacts would be allowed.

The FCC proposal differs in several ways from the ARRL no-code proposal in RM-6995 and other no-code requests. The February 8 release of Docket 90-55 proposes to stop issuing Novice and Technician class licenses so that the one point of entry into amateur radio would be the Communicator. This is substantially different in philosophy from what the ARRL and other petitioners had envisioned, but it is also not altogether surprising. With continued government cost-cutting, it appears as if the FCC is taking the occasion of the creation of the Communicator class license as a way of long term cost-reduction for itself.

On another front, the Technician class is the fastest growing of all license classes, and wields considerable political clout in the 1990s. Techs will not want to give up this political might, and they will probably fight to retain full licensing of this class, or request "grandfathering" to the next higher class of license.

There will be a comment period of six months. Comments on PR Docket 90-55 are due August 6 with replies expected no later then September 7, 1990. A good guess is that a final report and order to create the Communicator will be issued either at year's end, or at the Dayton Hamvention in April of 1991!

Excerpted from the Westlink Report with assistance from the ARRL, WA3VJB, KB4KCH, KC5CW, W5YI and W6RCL ...de WA6ITF

ASK KABOOM

The Tech Answer Man

Michael Geier KB1UM
PO Box 64766
S. Burlington VT 05406

More on Synthesizers

Last month we discussed the basics of frequency synthesis. As I hope you'll recall, we explored the concepts of the voltage-controlled oscillator and the phase-locked loop with its programmable divider. Now let's see what it takes to fix one of these beasts when it fails.

Is It Really Broken?

Before you try to fix your synthesizer, be sure it is actually broken! Many radio failures can cause the same result—a dead rig. It's important to use the process of elimination to avoid attacking the wrong circuits.

Does the power supply come on? If there are no lights or displays, the problem is in the supply, not the synthesizer. Is there any reception or transmission at all? Even if signals are weak, any operation on the displayed frequency indicates a working synthesizer. Does the frequency display show digits and tune properly as you turn the VFO knob? If not, the microprocessor and/or its associated display circuits are not working. Try the internal RESET button, and also check the lithium backup battery.

In the case of older ICOMs, a dead battery will wipe out the internal operating software, forcing you to send the memory board back to the company for reprogramming. In other rigs, a dead battery will cause memory loss, but the rig should still work. However, some rigs behave erratically when the battery is near the end of its life, so always check it before assuming a circuit problem. If the battery is of the usual flat lithium variety, it should measure 3 volts. Even a little less suggests imminent cell failure. If the battery is soldered in (most are), you may have to order it from the manufacturer. If there is another source of lithium cells with solder tabs, I'm not aware of it. (Any of you know of one?)

Scope It Out

Having gone this far, if you're convinced you have a real problem with the synthesizer, take a good look at your test equipment before you plunge ahead. Don't even *consider* attempting a repair unless you have a scope. This stuff is just too complex for VOM tracing. (Besides, the circuits operate with narrow, rapid pulses that just won't show on a meter.) A frequency counter is also very helpful. And of course, you'll need a schematic diagram of the rig. Finally, ask yourself whether you feel competent to do the job. Especially if the trouble is digital, some background knowledge is essential. Are you familiar with buffers, gates, data busses and microprocessors?

I'm not saying you have to be a whizbang programmer or a circuit designer, but you should at least know the difference between data and addressing, and have some idea of how RAM and ROM are used. You wouldn't drive a tractor-trailer if you didn't know how, so why mess up your expensive rig? But if you're ready, let's go.

Digital Woes

If the battery is good but the display or tuning knob operate incorrectly, then you may have a digital problem. Digital circuits rarely fail intermittently, except in the case of a cold solder joint. If an IC goes, it goes, the usual result being a pin stuck high or low. If this should happen on the data buss, odd things can happen. The rig may skip frequencies, or refuse to tune at all. The display may have segments stuck on or missing. Or the frequency of the rig may not match the display. I remember one case in which the mode (USB, CW, etc.) indicators wouldn't light, and the rig wouldn't TX or RX. But the display and tuning seemed fine. The trouble turned out to be two bad buffer chips used to send data to the mode control circuitry. They also had to drive the LEDs, and the extra current finally blew them.

If you've got no display at all, check the supply line going to the microprocessor and display circuitry. Usually, it's 5 volts. Sometimes, small 3-terminal regulators are used, and they can blow. If the voltage is there, scope the crystal used as the clock for the micro. If you see a waveform (usually a few MHz) on either crystal connection, then you know the clock is going. Although micros can go bad, it is unusual. More likely, the trouble is with an input/output (I/O) chip, or a memory chip. Make sure you are static-discharged, and then touch the top of each chip for a few seconds. If any one of them is very hot, then it is probably bad. They can, however, get a bit warm in normal operation, so don't be too zealous about this.

Check for pulses at the data and address lines of the micro. If some are there, the chip is probably OK. If possible, try to follow a simple function (like a mode selection) all the way to its indicator. If the voltage disappears along the way, you've found the trouble. If the display tunes but the rig is absurdly off frequency, check that data is going to the digital dividers. While you're there, check the inputs and outputs of the dividers for the presence of signals. An input with no output indicates a bad divider. Lack of an input signal suggests a bad VCO, which means you'll have to head for analog territory.

Detailed analysis and troubleshooting of the digital system can be next to impossible, because service manuals often don't describe the complex operations in great detail. If the tests so far haven't located the trouble, now might be a good time to find the shipping box and send the rig off for factory service.

Analog Blues

If the digital system seems to be working but the rig still won't play, you may very well have an analog problem, which is generally much easier to find than the digital stuff. Usually, one of two disorders will occur: an oscillator won't work at all, or it will be way off frequency.

The first thing to do is to check for the presence and function of any crystal oscillators which are mixed with the synthesizer's VCOs. There may be more than one. A dead crystal or other malfunction can stop the operation of the whole synthesizer, even though everything else is OK.

Next, scope each voltage-controlled oscillator. There may be several, as multiple loops are common. Be aware that some designs have more than one VCO per loop, and switch in the appropriate one according to which band you select, leaving the others turned off. If the rig works on some bands but not others, it's a dead giveaway that one VCO is not working.

Put the probe at the oscillator's output, where it feeds the rest of the rig. If there's no signal, and that oscillator is intended to be in use for the band you're tuned to, you've found your trouble. (If you're not sure which VCO comes on when, try various bands. They should all come on sooner or later.) Troubleshoot the oscillator as with any other. Most likely, the problem will be a bad transistor or an IC. Some oscillators have small trimmer capacitors to ensure that the oscillator will start. A bad or dirty trimcap can kill the oscillator. IC-745s often had this problem.

If the oscillator signal is there, check the DC control voltage coming into the varactor diode (which looks on the schematic like a cross between a diode and a capacitor). If it is swinging wildly, or is at ground or the supply voltage, then something is bad in the feedback network, which consists of the phase detector, loop filter, and DC amps. Occasionally, the VCO can be so off-frequency to begin with that the control voltage can get into an abnormal state trying to correct it. Especially if there's a trimcap, try adjusting the oscillator slightly. It may bring things back to normal. If not, start tracing back through the DC amps and loop filter. You may find a bad transistor. If not, check the phase detector. It has two inputs, one from the programmable divider and one from the reference. If they're there, check for an output. If there is none, the detector is bad.

Around and Around

Because synthesizers are loops, they can be tough to fix. If you've never done it before, you may go around and around for hours, because inputs affect outputs and vice versa; almost everything is dependent on everything else. The one circuit (besides crystal-controlled mixing oscillators) which is independent is the reference, so if all else fails, start there.

Given the complexity and diversity of today's synthesizer designs, there's no way we can cover all the intricacies in a column. I hope, though, that I've given you enough information to help you handle some of the more common failures. Now, let's look at a letter:

Dear Kaboom,

Two questions. First, what is the proper impedance mike to use with my TS-520S? The rig's input impedance is 50k ohms. Also, I've enclosed the diagram of the muting circuit of my R-1000 receiver. How do I make it mute?

Signed,
Shhhh

Dear Shhhh,

Always try to use a mike with the same impedance as the rig's input. In your case, a ceramic or crystal mike, or a dynamic with a matching transformer would do the trick. If you try a 600 ohm mike, you will find your audio very weak. As for the muting, it appears from the diagram you sent that grounding pin 7 of the remote jack would turn Q14 on and mute the receiver. The 47k ohm resistor (R113) ensures that very little current will flow through pin 7, so just about any method, such as a relay, switch or transistor, that connects the pin to ground, should work.

Have a tech question? Send it off to "Dear Kaboom" at the above address.

Number 12 on your Feedback card

TECH TIPS

Pearls of Tech Wisdom

Zero Beat Revisited

It is impossible to directly zero-beat a carrier using normal amateur equipment because the receiver audio usually won't pass much below 300 Hz. There is a way to do it to an accuracy of one or two hertz without using any test equipment or transfer methods, just the front panel controls of your transceiver.

You'll need two pieces of equipment: a receiver or transceiver (T/R) capable of AM and SSB reception, and a station transmitting a known RF frequency using AM mode and modulated by any steady audio tone between 500 and 1500 Hz (such as the National Bureau of Standards station "WWV" on 5, 10, 15, and 20 MHz.).

Warm up your T/R for at least 30 minutes. Then tune in the transmitting (TX) station fairly closely, using the AM mode on your T/R. Next, set your selectivity wide open, usually 6 kHz. This is a must!

Switch the T/R mode to SSB (LSB or USB), keeping selectivity wide open. Slowly tune for zero beat of the two audio tones (the tone transmitted by the TX station and the tone generated within your own SSB receiver). The difference between your dial frequency and the known RF frequency of the TX station is the error in your master oscillator. Note the difference, plus or minus. When zero beat is achieved it will sound like one pure tone. When you get close to zero beat you can actually count the beats but remember that the frequency difference is one half of the beats you count. If your error is less than 10 Hz you can probably live with that unless you're a perfectionist. No adjustment necessary. If the beat note sounds the same when tuning 10 Hz above and below the known frequency you are very close to zero. Most modern T/Rs only tune in 10 Hz increments, anyway.

To adjust your master oscillator set the dial to the frequency of the known TX station and carefully adjust the master oscillator trimmer for another zero beat of the audio tones. The higher the RF frequency of the selected TX station the more accurate your results will be. One other advantage of this procedure is that after calibration, when your T/R is cold, you can take a reading and follow it up in frequency until its drift is stable and see how long it takes to reach temperature stability. Also, choose a time when the TX station signal is fairly stable with little QSB.

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Merritt Island FL 32952

Try Hot Glue!

Have you ever been left holding a small item, such as a relay, and can't figure a method of mounting it? Ever build a small adjunct circuit board and wonder how you will hold it in place? Ever wonder how to fasten wires down so they can't flex? Here is my solution: Get a hot glue gun!

A while back I was given a hot glue gun for use on odd repair jobs around the house. It is handy and very easy to use. Just plug it in, wait for it to heat up, and pull the trigger (or push the glue bar) to force hot liquid glue out the nozzle.

The glue I use is flexible after flex-up (about 30 seconds) and adheres to everything I have tried it on. Some examples I have used hot glue for:

- Stand-offs and mounts for circuit boards.
- Fastening relays to chassis.
- Anchoring wires to exiting chassis.
- Weatherproofing coax connectors.
- Sealing antenna wire wall entrances.
- Vibration-proofing mechanical parts.
- Insulating bare wires.
- Anchoring coax wire to walls.
- Mounting hardware such as mike hooks.
- Weather-sealing bulkheads in cars.
- Attaching feet to equipment.
- Hand-forming grommets.

The list could go on and on. Use your imagination.

Glue guns are available at Radio Shack, Sears, and most hardware stores for less than $12. One passing thought: I was in a craft supply store recently and purchased a very small hot glue gun. The glue sticks are only the size of a pencil. It is a little easier to handle in those tight spots. It cost $2.95 and I got 25 glue sticks for a dollar.

Bill Clarke WA4BLC
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Falls Church VA 22042

Easy Radial System

Most of you know that a vertical antenna won't work worth a flip without a decent radial system, but you'd rather roll naked in broken glass than do it. It's a real chore!

Just attach a pizza cutter to a shovel, hoe or other handle with a couple of worm drive stainless steel auto water hose clamps. When the area is well-watered follow behind with a roll of soft aluminum wire and a hammer and stake for driving. Water again when finished.

Using this method, hundreds of feet can be done in just a couple of hours. No blisters, no sweat. (The radials do NOT have to be perfectly straight.)

Terry Staudt, L.P.E., W0WUZ
616 N. Sheridan
Loveland CO 80537

Cassette Box Special

Replace that Guy Lombardo tape with a 5-watt 80m transceiver!

by Michael Jay Geier KB1UM

The search for suitable cabinets for my electronic projects has led me to everything from Radio Shack project boxes to dessert containers to pillboxes! My perennial favorite, though, is the cassette box. These cheap little gems are great for lots of things, including meters, battery holders, switchboxes, and even entire perfboarded circuits. And after I've used my $1.50 housing, I still have a cassette! What a bargain.

So, naturally, it seemed like a good idea to try to build an entire transceiver inside one. As it turned out, it wasn't even an especially tight squeeze.

I wanted the rig to be stable and sensitive, to have some active filtering on the receiver, and to generate sidetone in transmit. Also, it should include a key, and put out enough power to make real contacts. And, as always with my projects, coil winding should be kept to a minimum (I hate winding coils).

The result is the Cassette Box Special. It's a 5-watt, 80-meter crystal-controlled rig with a direct conversion receiver. It has only one very simple coil to wind, and only one set-and-forget adjustment! It uses 12 volts, and pumps audio to a pair of "Walkperson" headphones.

Circuit Description

Q1 is the crystal oscillator for both receive and transmit. It's a MOSFET. Radio Shack used to carry it, but has discontinued it. Check your local store—there are still plenty of them on the shelves. In fact, that's where I got mine. If you can't find one locally, you can order it from the parts supply sources shown at the end of the article.

In transmit the oscillator's output, shifted down approximately 700 Hz by C4, feeds Q2 (the driver), and Q3 (the final), which is also a MOSFET (and is still in the Radio Shack catalog). The driver and final are keyed together, while the oscillator runs full time. Q3's output is filtered by L4 and its associated capacitors, and fed via the TX/RX switch to the antenna. C15 generates the sidetone by forcing the audio amps into oscillation. R14, at the audio output, cuts the sidetone level down to keep it from knocking your head off.

In receive, the oscillator feeds gate 2 of Q4, the mixer. Gate 1 is fed with the incoming signal, tuned by L1 and C12. Careful attention to the design of the input coupling (by L2 and C11) results in minimal detection of unwanted AM signals. The mixer's output is fed to the high gain audio stages, Q5–Q7. Capacitors in the gate and drain leads of Q5 form a low-pass filter, removing some of the high frequencies which may be present in the received signal. C20, in conjunction with audio output transformer T1, provides a strong peak in the audio passband around 700–800 Hz and, with Q6, forms a fairly steep active filter. The transformer feeds the "Walkperson" headphones, driving them with plenty of volume.

Finding the Parts

The TX/RX switch has to perform six functions, so a single 6PDT switch is your best bet. You can buy one, or you may be able to scrounge one up for almost nothing. Kiddie walkie-talkies and cassette tape recorders have this type of switch—you may have a few lying around. I got my switch at a hamfest. Of course, you can also gang several switches together, or even use a relay, though it had better be a small one if you want to get this thing into a cassette box.

The crystal can be a surplus unit or one ordered from a crystal house. Try to get a high-activity crystal. Most rocks work well, but some can be sluggish, reacting badly to

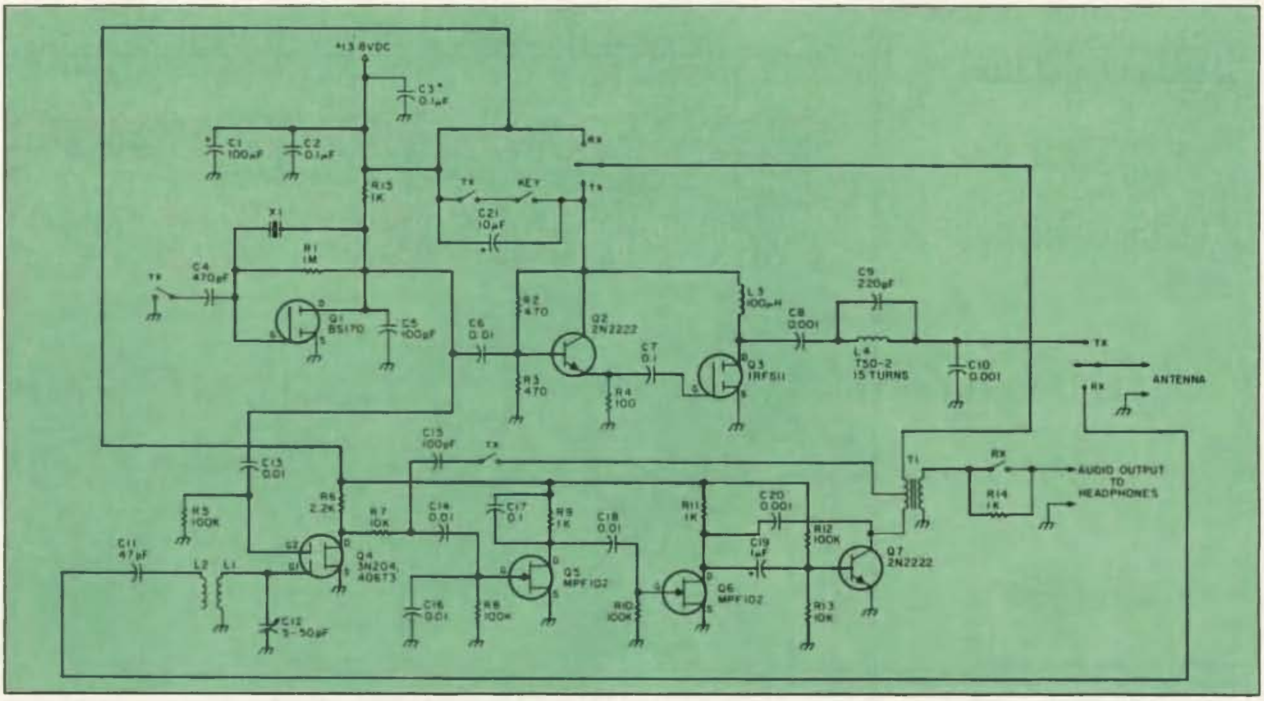
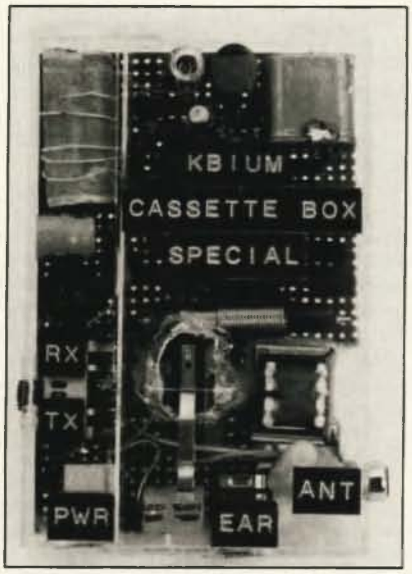


*Figure 1. Schematic for the KB1UM "Cassette Box Special." The switch contacts are marked as when their functions are closed. That is, a switch marked TX should be closed in transmit and open in receive. *C3 mounted right at B + input.*



the change in load presented to the oscillator when you key the rig. In particular, avoid 3.579545 MHz colorburst crystals, as many don't work too well. Besides, using that frequency is just asking for TVI problems, both to and from your neighbors. You'd be amazed at how loud their TVs' color oscillators can sound in your receiver. Good frequencies to try are 3.560 MHz and 3.710 MHz, the recognized QRP frequencies.

The type of crystal you use may affect the amount of transmit offset provided by C4. For more offset, increase the value of C4; for less, decrease it. You can get multiple frequency operation by using more than one crystal and a selector switch, if you can fit it all in the box. If the frequencies are as widely spaced as those two, though, you may have to retune C12 when you switch frequencies.

L1 is an antenna coil from an AM transistor radio. At worst, you can buy a radio and remove the coil. I used one from a Radio Shack Flavoradio, and it worked fine. Just about any AM coil should do. If it has a tap or other windings, leave them unconnected and use the longest winding. Simply remove the coil from its ferrite core and then wind 5 turns of wire-wrap or similar wire around it, spread out over its length, to make L2.

Winding

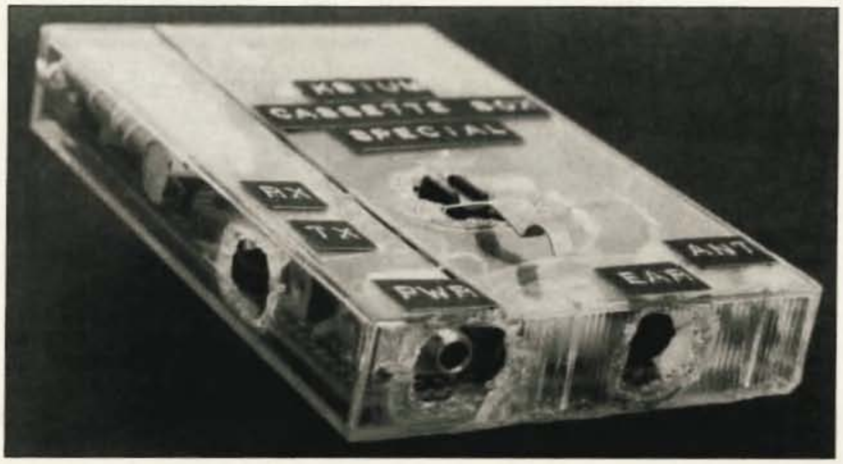
There's only one coil to make. Get a T50-2 toroid and wind 15 turns of #26 enameled wire, spreading it two-thirds around the toroid. Coat it with nail polish to hold the windings in place, and you're done.

Construction Details

The key word here is "flat." First, prepare the cassette box. I used a clear one, and I suggest you do the same. They're popular and easy to find, and the result is pretty and interesting. Separate the two halves, and then clip off the spindles with a pair of dikes. Be careful not to crack the box, as the plastic is very brittle. Now, run your soldering iron over the spindle stumps to flatten them out.

A few words about working with this kind of plastic: The only way I've ever found to do it is with heat. Attempts at drilling resulted in a cracked or broken box. The stuff melts easily and can be shaped or formed any way you like. Try not to breathe the smoke, though, as it can't be very good for you. Also, always wipe and tin your iron tip after it touches the plastic, or the tip may become too contaminated to melt solder. If possible, use a separate, cheap iron to do your plastic melting.

You will have to make some holes in the box, but save that until after you've built the board, because the holes' locations will depend on your placement of the switches and jacks.



The "Cassette Box Special" 80m CW transceiver.

Parts List

Q1	BS170	Digi-Key BS170
Q2,Q7	2N2222	RS 276-2009
Q3	IRF511	RS 276-2072
Q4	3N204 or 40673	Jameco 40673
Q5,Q6	MPF102	RS 276-2062
X1	CRYSTAL	
L1	AM antenna coil from radio	
L2	5 turns spaced over length of L1	
L3	100 µH choke	RS 273-102
L4	15 turns #26 enameled wire on T50-2 toroid	Radiokit T50-2
T1	1KΩ CT to 8Ω audio output transformer	RS 273-1380
C1	100 µF, 25V or more	
C2,C3,C7,C17	0.1 µF	RS 272-109 (5 per pack)
C4	470 pF	
C5,C15	100 pF	
C6,C13,C14, C16,C18	0.01 µF	
C8,C10,C20	0.001 µF	
C9	220 pF	
C11	47 pF	
C12	5–50 pF trimmer	RS 272-1340
C19	1 µF, 25V or more	
C21	10 µF, 25V or more	
R1	1 megΩ	
R2,R3	470Ω	
R4	100Ω	
R5	100KΩ	
R6	2.2KΩ	
R7,R13	10KΩ	
R8,R10,R12	100KΩ	
R9,R11,R14,R15	1KΩ	
RX/TX SWITCH 6PDT		
Heatsink	TO220	RS 276-1363

Sources: Digi-Key Corp.
701 Brooks Ave. South
P.O. Box 677
Thief River Falls MN 56701-0677
(800) 344-4539

Radiokit
PO Box 973
Pelham NH 03076
(603) 635-2235

Cut a piece of perfboard to fit the cassette box. If you use the Radio Shack audio output transformer, as I did, you will have to cut away enough of the board to allow the transformer to fit in the box, because it is too thick for mounting on the board. In fact, the transformer doesn't quite make it as it is, and the plastic flanges where the wires exit will have to be melted a little to make it slightly thinner. If you can get a smaller transformer, do so, although you may have to experiment with the value of C20 to make it resonate around 700 Hz. The exact frequency isn't critical: you just want it to peak somewhere near the CW pitch you like to hear.

The final transistor must be heat-sinked. Don't forget to use silicone heatsink grease for efficient heat transfer. Bend the fins of the heat sink flat so it will fit into the box.

Assemble the circuit, placing the TX/RX switch and power, earphone, and antenna jacks at the edges of the board. Although layout isn't critical, try to keep the audio output transformer away from the antenna coil (L1/L2), or feedback can occur. Be especially careful to wire the TX/RX switch correctly. I have marked the switch contacts as to their function when closed. That is, a switch marked TX should be closed in transmit and open in receive. The two double-throw contact sets are marked in obvious fashion.

If you can't find a 100 µF capacitor (C1) that's thin enough, use two 47 µF caps in parallel. The exact value isn't critical. Also, place C3 (0.1 µF) right at the DC power input jack for maximum protection from RF feedback and instability.

I used an eighth-inch earphone jack for DC power, a stereo jack for the headphone output, and a phono jack for the antenna. Wire the headphone jack using only the tip and midpoint, leaving the ground (ring) unconnected. That way, the left and right phones work in series, which seems to provide the best sensitivity. Also, I used a microswitch with a lever arm for the key, mounting it on the board so that it stuck out through a hole in the top of the box. If you elect to use a separate key, keep the wires under one foot in length. Do not use an electronic keyer, as all the current for the transmitter passes through the key!

After assembly, check for any wiring or polarity errors. Be especially careful to match the polarity of the DC power jack to that of your power source! Next, place the TX/RX switch in receive and then connect power, antenna, and headphones. Adjust C12 for maximum signal or band static. It should sit at about ¼ total rotation. The peak is very sharp, and it may take a few tries before you get it just right. I made a hole in my box so that I could touch it up if necessary.

Slide the board into the large part of the cassette box and mark the spots for the holes for the switch, key, and jacks. When you're done making them, assemble the box and melt the edges together. That's it!

Operating Tips

The radio is designed to operate from 12 volts, and will work OK from about 10–14. At 12 volts, it produces approximately 5 watts in transmit. Use D batteries or a gell-cell, as the transmitting current drain is substantial enough to wipe AA cells out in short order.

Like most direct conversion rigs, the receiver is fairly microphonic. That is, if you tap on it, you'll hear it in the headphones. It should not oscillate or show any other kind of instability. If it does, try reversing the output leads from T1 (the side going to R14). Also, the rig is best operated on battery power, to avoid hum problems. In some locations you may get some hum induced from the table on which the rig sits because there is no shielding in the box. Try placing the radio on the battery pack.

There is, of course, no sideband filter, so you'll hear signals on either side of zero beat. If you hear a strong signal but get no response to your call, the other station may be listening on the wrong sideband to hear you! Oh well, such is life in the direct conversion world.

Finally, avoid long keydown periods. Although the rig is stable into all but the worst SWR, the heat sink is small and gets pretty hot. You'll notice the box getting warm, but it shouldn't be a problem with normal use.

Enjoy your "Cassette Box Special." You'll have fun with it on the air, and it's guaranteed to turn a few heads when you show it around!

Michael Geier KB1UM is 73's troubleshooting "Ask Kaboom" columnist. You can reach him at PO Box 64766, S. Burlington VT 05406.

RTTY LOOP

Amateur Radio Teletype

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Back to BCNU

In February I began to look at ways to digitize images into a form that could be transmitted to an amateur over radio links, giving new meaning to the acronym "BCNU." While the previous board covered was directed more at the mainstream computer market, this month's entry has a clear vector into our sector.

MFJ Enterprises, Inc., is a company well known to many of us for its fine line of amateur radio equipment. They have entered this market with the MFJ-1292 "Picture Perfect" video digitizer. Aimed squarely at the amateur radio market, this board offers some features which uniquely suit it to the task at hand.

The MFJ-1292 is a ¾-length card, which can be installed in any available 8-bit slot in an IBM PC/XT/AT compatible computer. An onboard DIP switch allows configuring the board for other than the default port address of 0330 hex. Once plugged into the computer's bus, video input is fed to a jack on the card, and a small controller box, sporting brightness and contrast controls, is plugged in as well. The latter uses a small, 5-pin header plug that may take a bit of fiddling for less agile hands.

An external monitor may be connected as well to another RCA jack on the card. This may be useful for adjusting the contrast and brightness of the incoming image.

Using the "Picture Perfect" MFJ-1292

Once installed, the board is addressed through a supplied program, MFJPIC.EXE. Loading the program reveals options including:

A. Change digitizer port address
B. Digitizer brightness adjustment
C. Capture picture from camera into buffer
D. Display picture
E. Save raw digitizer data to disk
F. Load raw digitizer data from disk
G. Save compressed picture to disk
P. Save PCX format file to disk
S. Save multilevel SSTV image to disk

As you can see, other than just capturing and saving an image, you have quite an array of options.

This screen, and all subsequent options, are displayed on a simply formatted text screen. Either the initialed letter, or in some cases a function key, may be used to select an option. A mouse is neither supported nor required, and the only graphics display is for viewing a captured picture. This would presume that, if displaying an image was not a requirement, about any display would suffice.

Initially, the brightness of the digitizer may be adjusted by selecting option "B" and using an on-screen bar graph to set the contrast and brightness controls to mid range. Finer adjustments really require looking at each captured image, making the necessary adjustments, and capturing and viewing again.

Typing "C" initiates a capture, a process which takes several seconds. The image must remain stationary. Digitizing a moving image, such as a live subject or something on a television show, is very difficult.

Saving Your Data

Images may be saved to disk in a variety of formats. The most versatile, from the program's point of view, is raw data. This allows all other permutations to be selected at a later date. All other options lock you into the mode selected. A compressed picture format is provided, which is supported by MFJXFER, a program which can send pictures in this format over packet circuits. For general utility, the PCX format, also known as Z-Soft format and used in that company's PC Paintbrush series of programs, is also supported. Within that mode, data may be saved in five formats: B&W (640x 200x2), CGA (320x200x4), EGA1 (640x350x16), EGA2 (640x400x 16), and VGA (320x200x256).

Note that while display of an image on-screen is limited by the installed graphics adapter (a VGA image display cannot be accomplished on an EGA or CGA adapter, for example), you can save pictures in any of the above formats. Images can be saved at resolutions higher than what you have, for others' benefit.

Along with the MFJPIC program detailed above, the MFJ-1292 is supplied with several other useful routines. MFJVC.EXE allows you to view saved, digitized pictures, or pictures received over the air. A screen capture utility, MFJBCD.COM, allows graphics images from CGA, EGA, or VGA displays to be captured for later use. MFJBCC.EXE converts pictures saved by MFJBCD or MFJPIC to a format suitable for transmission over packet radio. This transmission may be accomplished by MFJXFER.EXE, another included program, or with MFJ-MULTI.COM.

A review of a digitizer would somehow not be complete without a sample image, and I hope Figure 1. fills the bill. This is a VGA mode (320x200x256) image of the same photo of my son that I used to look at the previous digitizer in the February column. With a gray scale pixel format you can stretch and shrink easier, but it does degrade sharpness a tad.

A Mixed Bag

Now, there is no facility to edit the saved pictures. This would presume some other graphics program which could handle the PCX format. A picture could be saved in PCX format, edited, and loaded back into the system in its revised form. No format conversion is possible, however.

Other problems with this system revolve about the timing and method of image capturing. The time required for an image capture is long enough that, as noted, a moving image cannot be used. I tried to have one of my children sit in front of the camera for this review, but settled on a photograph when it became apparent that a live target, at least a young one, is not a feasible subject. Further, the requisite lapse between adjusting the contrast and brightness and viewing the results makes obtaining the optimum setting a bit of a hit or miss situation.

For many situations, the gray scale type image produced by the MFJ-1292 is preferable to the dithered dots of other digitizers. Additionally, with packet picture interchange addressed, the MFJ-1292 fills a unique niche in the market. As I suggested, a mixed bag if ever there was one!

For amateur radio use, and some desktop publishing, where the gray scale ability of the MFJ-1292 is important, this may be the best card to have. For a package price of $199.95, this unit is well within range for many interested amateurs. Drop a note to MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762, for more information. As always, be sure to mention "RTTY Loop" when you do.

I remain available, albeit on an irregular basis, on CompuServe (ppn 75036,2501) and Delphi (username MARCWA3AJR) for your comments, questions, and critiques. Let's try to get out the soldering iron for next month's RTTY Loop!

Figure 1. Photo digitized with MFJ-1292 at VGA (320x200x256) resolution.

Number 19 on your Feedback card

PACKET TALK

Latest in Digital Hamming

Brian Lloyd WB6RQN
124 Churchill Avenue
Palo Alto CA 94301

More on the Univeral Interface

Gary Morris N6QAF suggests a change to the standardized radio/TNC interlace I described in my article in the October 89 issue of *73*. It seems that Gary uses a Drake TR-4 on HF, and the TR-4 requires that a positive voltage be applied to the Push-to-Talk (PTT) line rather than the more common technique of pulling the PTT line to ground to key the rig. Gary suggests bringing the positive keying voltage from his PK-64 out to the pin used for external squelch detect so that both kinds of keying signals are available at the interface.

There are two problems with this approach: 1) very few TNCs offer a positive PTT signal anywhere inside, and 2) the external squelch/carrier detect is important. All TNCs offer the "ground to key" type of PTT signal, so they have this in common. Also, some radios, most notably the new Kantronics packet radio, have better carrier detect circuits than most TNCs, so you don't want to give up the external carrier detect signal to the TNC.

PTT Level Converter

There is a fix for this, and it adheres to the original purpose of a universal interface: to hide the difference between radios. Simply add a PTT level converter to the radio or the radio cable. You can build this converter with only one transistor and two resistors. It is small and it will fit right inside the cable hood, or you can add it to the radio with very little trouble. See the circuit diagram.

The keying transistor is any PNP transistor that will handle the current the rig's keying circuit requires. Better measure it to be sure. The +12V source can be any convenient positive voltage source, as long as it is high enough to key the rig. I picked +12V because it's already there to power most TNCs.

The easiest way to construct this is to actually put it inside the radio where the radio can supply the necessary positive voltage and the circuitry is out of the way.

The Stagnation of Packet Radio

I have been a packet radio enthusiast for seven or eight years now. In fact, I was playing with packet radio before it officially existed. I started experimenting with block transfer of transparent (binary) data shortly after the FCC permitted the transmission of ASCII data. So I guess that I qualify as the packet radio equivalent of an old-timer. This may mean nothing, but I hope that you will continue reading and at least pretend that I know what I am talking about (hi hi). Here it comes:

Amateur packet radio in the United States and most of the world has reached a point of stagnation. If you love packet radio as much as I do, this is cause for significant concern.

Let us look at it historically. The first real TNCs were the "Vancouver Board." I saw one of these things long ago. At that time the protocol was not AX.25 and your parameters were burned into a PROM rather than being changeable. You had to scrounge the parts to populate the board, and beg, borrow, or steal a Bell 202 modem. Needless to say, it was not a turnkey operation, but if you were interested enough, you bit the bullet and built one.

Then along came the Tucson Amateur Packet Radio Corporation (TAPR). TAPR gave us a kit that almost any ham could build. They called it a TNC, and later it became known as the TNC-1. But the TNC-1 was only slightly better than the old Vancouver board. Yes, you could change the parameters and enter your callsign, but it still ran at 1200 bauds and used a Bell 202 compatible modem.

Next, AEA came along. AEA legitimized packet radio by turning the TNC-1 into a product and selling it through the traditional amateur radio distributor chain. Technically, it was still a glorified Vancouver board.

About that time things began to happen on the application front. I cobbled together a RTTY-to-packet gateway. (I lived in the Seattle/Tacoma area where VHF RTTY was a well-established art; where the RTTY enthusiasts were also the packet enthusiasts.) WØRLI came out with his packet BBS for the Xerox 820. It worked, and we had electronic mail.

We also wanted to communicate beyond our own neighborhoods. To that end we began installing digipeaters on mountain tops. In the Pacific Northwest we planned a chain of digipeaters that would connect from Portland, Oregon, to Vancouver, B.C. That was when we discovered that mountain-top digipeaters don't work so well.

TAPR came out with the TNC-2. This really started the ball rolling. The TNC-2 clone manufacturers got on the ball and the price for a TNC dropped to where you could buy one for a little over $100. This started the mass "packet revolution." On the technical side, the TNC-2 was just a smaller and cheaper TNC-1, which means that it still wasn't much removed from the old Vancouver board.

What Isn't Happening

I could go on about PCs, better bulletin board programs, NET-ROM, and the like, but I think that you are beginning to get the picture. In most of the world, amateur packet radio has remained relatively unchanged since its inception. We still do keyboard-to-keyboard chats and exchange electronic mail via bulletin board at 1200 baud. Ho hum. I can do that better on a landline, with a modem, and not need a radio or an amateur license. Perhaps we should take note that most of the discussion of packet radio takes place on CompuServe or on the Internet.

Now comes the serious part. This lack of progress has begun to lead to a packet radio "brain drain." The people who did much of the original work have begun to leave packet radio for other endeavors. A few months ago, at a dinner meeting with several technically-minded "doers" (hams who actually create new packet technology), the discussion turned to who was doing what. Dan Frank W9NK, author of the public domain NET-ROM code used in the KA9Q Net package, said that he was tired of doing the work and never perceiving any change. He said that he took his station off the air, and he was going to do other things until a "real" packet radio network appeared.

This is happening elsewhere in packet radio, too. In the bay area several of the hams who create new technology have decided to go off on a commercial venture and generally abandon amateur packet radio. Their reasons? "Hey, nobody really cares anyway, so why should we beat our heads against a brick wall? At least commercially we get paid for what were giving away for free."

Even I am not immune. All of my packet radio operation today is spent gathering material for this column. I find that I would rather put in an extra hour at work (computer-networking related) and not on packet radio. Why? I am quite frankly bored with sending mail through my local BBS when there aren't many other technical people like myself to talk to anymore, at least not on packet radio.

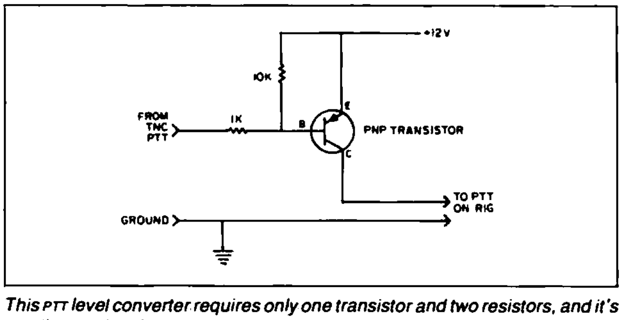
Lest I sound like sour grapes I must add that much of what I know about computer networking has come as a result of my packet activity. The company that I am now working for pays me what I consider to be a substantial salary for my networking knowledge—knowledge that was mostly garnered from building and maintaining the amateur TCP/IP-based packet radio network in Washington, D.C.

OK, things are bad here but what about the rest of the world? Well, Japanese hams seem to be doing new and interesting things. They have real networking, dirt-cheap 9600 bit-per-second modems that work with ordinary radios, radio-based FAX, and digital image transfer. They are experimenting with higher speeds and higher frequencies. More software is coming to the US from Japan and a few places in Europe than is flowing in the other direction. It looks like we are going to lose the technical lead even in our hobby.

What is the Answer?

What can we do to turn the tide? For once I don't think I have an answer. Perhaps it is simply a function of the general malaise that seems to have a grip on amateur radio in the United States. I think that perhaps this stagnation in the most promising and dynamic aspect of amateur radio is simply a sign that amateur radio in the US is dying. Maybe we *should* have our more useful frequencies put to better use. Sure, we are nice to have around after the odd earthquake or hurricane, but is that sufficient justification for tying up lots of valuable spectrum?

This column is likely to be the most controversial I have written. I suspect I will get a large ration of hate mail accusing me of wanting to destroy amateur radio. I will tell you right now that this is not the case. On the other hand, I think someone needs to say that we have a problem we need to deal with. Ignoring it won't make it go away, and neither will lawsuits and lobbying the FCC and Congress. For amateur radio and amateur packet radio to get back on the ball and begin growing, it will take the work of thousands of active and interested hams, not just the League or a few activists. Will you be one of them? 73



This PTT level converter requires only one transistor and two resistors, and it's small enough to fit inside the cable hood.

Number 20 on your Feedback card

Hams Around the World

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3Y0B DXpedition Postponed

As I write this month's column during mid-January, the Club Bouvet (3Y5X) DXpedition to Bouvet Island has gone QRT. The operators reportedly departed the island on January 14 after more than 40,000 contacts and a two-week operation plagued by an unusual amount of malicious interference. Bear with me, and I'll get to that shortly.

In the January DX column, the League of Indianapolis DXers' DXpedition to Bouvet (3Y0B) was featured, but just a few days before Christmas, Mike W9SU, the expedition director, announced that the DXpedition had been "...postponed indefinitely and perhaps permanently." During late 1989 the 3Y0B group had decided to team up with another group of operators and include operations from other sub-Antartic islands, such as the South Sandwich Islands and possibly South Georgia. Unfortunately, the vessel contracted for the trip to Bouvet wasn't available long enough to include trips to the other islands, and the search for an alternate vessel with adequate capacity was unsuccessful. The rumor is that this group will try again during late 1990.

DX Policemen versus Lids

The Club Bouvet DXpedition (3Y5X) to Bouvet Island should have been, under normal circumstances, one of the great DX events of the decade. Unfortunately, it turned into a battle between the DX policemen and the lids. 3Y5X's transmit frequency, especially the 20 meter SSB frequency, was turned into a battleground. Deliberate interference, profanity, insults, shouting matches between DXers in the US and other countries, and generally very rude behavior, made it difficult for many DXers to even hear 3Y5X. The mess on the SSB frequencies was probably the worst, but the CW frequencies had their share of mayhem as well. The bogus 3Y5X who insisted on sharing the frequency with the real 3Y5X did nothing but aggravate the situation. One reader gave up the hunt in extreme disgust over "...the shenanigans of the lids, the cops and the ops!...and the Slims."

> ***"The DX operator should periodically state where he or she is listening and refrain from transmitting on the DX station's frequency."***

We have had our share of deliberate interference, etc., with DXpeditions before, but not with this severity. Many DXers were already frustrated when 3Y5X came on the air a few days late due to bad weather conditions. The size of the ensuing pile-ups and the amount of spectrum covered by the pile-ups did nothing but aggravate the situation. The self-appointed DX policemen became agitated with everyone who transmitted on the wrong VFO and ended up on 3Y5X's transmit frequency.

We Don't Need It!

Not content with saying "up" or "wrong VFO," the policemen resorted to insults, then more often than not the admonished DXers responded in kind and the frequency turned to bedlam. Long hours of calling 3Y5X with no results led to frustration and in some cases complaints on 3Y5X's frequency, which in turn brought retaliation from the policemen.

We as DXers don't need this kind of frustration, and certainly not the bedlam experienced on 3Y5X's transmit frequencies. This is a great hobby, not a torture session. What can we do to prevent this unpleasantness from happening again, with other DXpeditions? We don't need policemen; the DX operator can police his own frequency. The DX operator should periodically state where he or she is listening and refrain from transmitting on the DX station's frequency.

If you get upset in a pile-up, take out your frustrations elsewhere, but not on the air. Most important, we must police ourselves, clean up our operating practices, and be serious about our hobby—working DX.

Pile-up Techniques

Apart from those super stations that can produce dominant signals, most DXers must stalk rare DX in much the same way a hunter stalks his prey. Locating DX has become a simpler task in this era of DX spotting nets on VHF and packet DX reporting networks, but once the DX station is found, the average DXer must often use every technique available to get the DX station's attention and work it.

The most important technique is listening. Listen, listen, listen. Listen very carefully to what the DX station is doing. Each time a station is worked in the pile-up, listen to the pile-up and determine the station's frequency. Is the DX operator working stations a little higher in frequency with each contact? Lower? Or does he stay on the same frequency for 5 or 6 contacts?

Listen and learn what the DX station is doing, then based on the station's pattern, make your transmission on the frequency where you think he or she will listen next.

Also make note of how quickly the DX station works stations in the pile-up. If the DX station is working stations very quickly, send your callsign only once, perhaps twice, then listen again. *(Regarding pile-ups and proper DX operation, see also the December 1989 "Never Say Die," page 82.—Eds)* These are only a few of the many techniques for working stations in a pile-up. Listen and you'll discover many more. ■

Number 21 on your Feedback card

HAMSATS

Amateur Radio Via Satellite

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Houston TX 77083

They're Up!

After numerous delays and rescheduling, the Microsats and new UoSATs are in orbit. At 0135 UTC on January 22nd, an Ariane 4 rocket lifted from the jungles of French Guiana carrying seven satellites into space. SIX of them were amateur radio satellites.

The main payload, SPOT-2, the French imaging satellite, was released soon after the third-stage burn was completed. The two UoSATs from the University of Surrey were next, followed by the four Microsats. Hams around the world breathed a sigh of relief as they monitored the launch via satellite TV or the AMSAT Launch Information Net Service (ALINS).

The ALINS system used a telephone bridge to connect net control operators. These stations then rebroadcast the launch on HF and VHF, and through OSCARs 10 and 13. Anyone who wanted to hear the launch information could find a copyable source with ease.

On the first orbit following launch, the Argentine ground control station commanded LUSAT to activate the CW telemetry beacon on 437.125 MHz. Stations in the States listening for signs of life from the Microsats were greeted with very strong CW signals when the satellite came into view.

Next, N4HY in Princeton, New Jersey, attempted to activate the packet telemetry systems on the new hamsats. The chore proved to be more difficult than expected. System initialization did not take place on the first pass over North America, but by the time you read this, the Microsats should be available for use. For those with two meter packet stations, DOVE can be heard on 145.825 MHz. Standard FM AX.25 packet telemetry can be monitored with any antenna when the satellite is in view.

Check the Sunday AMSAT Net on 14.282 MHz at 1900 UTC for updates. Complete news and progress reports are also available on packet bulletin boards and via ARRL announcements. Microsat and UoSAT data can be found in the May 1989 issue of *73*. Look for "The AMSAT-NA Microsats" by Courtney Duncan N5BF and "Experimental OSCARs" by Jeff Ward GØ/K8KA.

Table 1. Listing of CODE.IN for RS10 DE WA5ZIB AR

```
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 00 01 01 01 00
01 00 00 00 01 00 01 00 01 00 00 00 01 00 01 01 01 00 01 01 01 00
01 01 01 00 01 01 01 00 00 00 01 01 01 00 01 01 01 00 01 01 01 00
01 01 01 00 01 01 01 00 00 00 00 00 01 01 01 00 01 00 01 00 00 00
01 00 00 00 00 00 01 00 01 01 01 00 01 01 01 00 00 00 01 00 01 01
01 00 00 00 01 00 01 00 01 00 01 00 01 00 00 00 01 01 01 00 01 01
01 00 01 00 01 00 00 00 01 00 01 00 00 00 01 01 01 00 01 00 01 00
01 00 00 00 00 00 01 00 01 01 01 00 01 00 01 01 01 00 01 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF
```

Table 2. Listing of BINCON.BAS

```
1 REM 'BINCON.BAS' VER 1.0 15JAN90 GW-BASIC
3 REM BINARY CONVERTER PROGRAM FOR EPROM
  BURNERS
5 REM INPUT FILE MUST BE HEX CAPS IN ASCII FORMAT
7 REM INPUT FILE SHOULD BE NAMED 'CODE.IN'
10 OPEN "CODE.IN" FOR INPUT AS 1
20 OPEN "EPROM.OUT" FOR OUTPUT AS 2
30 IF EOF(1) THEN 120
40 X$=INPUT$(1,1)
50 IF (X$=CHR$(32) OR X$=CHR$(10) OR X$=CHR$(13))
   THEN 30
60 L=ASC(X$)-48:IF L>9 THEN L=L-7
70 X$=INPUT$(1,1)
80 R=ASC(X$)-48:IF R>9 THEN R=R-7
90 PRINT#2,CHR$(L*16+R);
100 PRINT L,R
110 GOTO 30
120 CLOSE
130 END
```

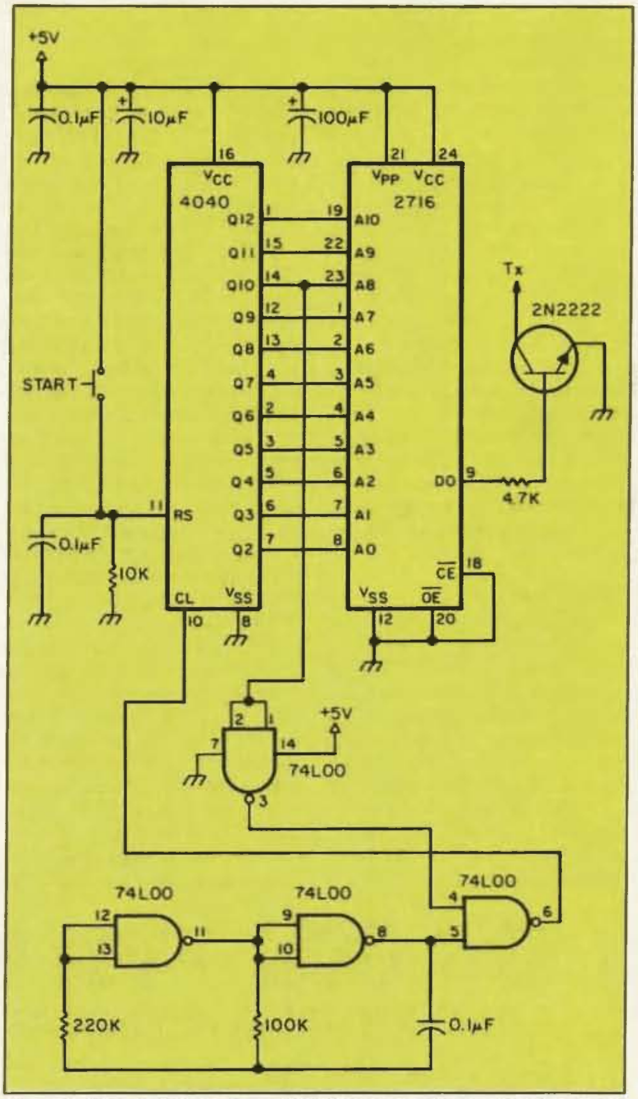

Figure 1. Robot ID Keyer from VK3ZOT. Note: The rectangular boxes are resistors.

Robot Chasing

With hamsat news dominated by Microsats, the Phase 4 geostationary program and the high-orbit satellites, it has been easy to overlook the significance and usefulness of the low-flying Soviet RS satellites.

Most satellite enthusiasts got their start by listening to amateur satellite signals on ten meters. The first hamsat to provide a communications transponder with a ten meter downlink was AMSAT OSCAR 6 launched in 1972. The 145 MHz uplink paired with the 29 MHz downlink became known as Mode "A".

The RS series has continued with Mode "A" as its most common transponder configuration. Today RS-10 can provide newcomers with satellite communications for a minimum investment. The article "Poor Boy Satellite Station" by Allan Fox N5LKJ in the December 1989 issue of *73* should inspire many to try ham radio's repeaters in the sky.

The ROBOT

The ROBOT, or autotranspon-

der, has been a feature of RS satellites since RS-6. For RS-10 the ROBOT can be heard calling CQ on 29.402 MHz. While calling, it announces the uplink frequency it will monitor. For Mode A this is 145.820 MHz.

To call the ROBOT, first center your uplink carrier until it is a steady tone on the ROBOT's downlink. Call the ROBOT at a CW speed close to the speed that you hear. An example sequence would be RS10 DE WA5ZIB AR (where AR is a continuous di-da-di-da-di with no spaces).

The autotransponder will send a message including your callsign and a QSO serial number. Copy the number and other information. When requesting a QSL from Box 88, Moscow, USSR, be sure to include the serial number along with the usual date, time and frequency information.

ROBOT Caller

Newcomers to the ROBOT encounter two problems: If their CW is not perfect, the ROBOT will not respond, or if they use a computer system or any device employing a microprocessor to send perfect code, there may be excessive noise in the ten meter receiver.

Figure 1 shows a solution to this problem. This simple-to-build, three-IC circuit is from Tony VK3ZOT in Montrose, Australia. Tony advises that Dave VK3YMP uses a similar device in his 23cm beacon in Melbourne.

The three ICs needed are a 74L00 low-power quad NAND gate, a CMOS 4040 12-bit binary counter and a 2716 2K x 8 EPROM. If you can't locate a 74L00, a 74HC00 or 74HCT00 will do fine. Chips like the 7400, 74S00 or 74LS00 will not work without circuit modifications. Almost any 2K x 8 EPROM will function in the circuit as long as it has the same pin-out as a 2716 and will run off a single 5 VDC source.

Operation is very simple. The 74L00 acts as a clock for the 4040 as well as a gate for the keyer clock. When pins one and two of the 74L00 are taken high, the keyer stops. The 4040 provides a ripple-counting function to sequentially change the EPROM address lines to read a CW message previously programmed in the 2716 EPROM.

Only one output line from the EPROM is used: D0. It feeds the base of a 2N2222 transistor. The collector of the transistor is connected to the CW key line of the two meter transmitter. When the start button is pressed the message is sent in perfect CW without the use of an RF-noisy computer.

Only a few hundred bytes of the EPROM are needed for the short message to call the ROBOT. Since EPROM programmers are easily available, it is more convenient to use the 2716 than hard-wired diode-matrix systems.

To get the message into the EPROM, first make a file named CODE.IN on a PC-compatible computer, using a word processing program or other means to create ASCII text. Table 1 shows an example. The first line is all zeros to allow a pause before the message begins. Each "dit" is noted as "01". A "dah" is "01 01 01". A space between letters is "00 00 00", and a space between words is "00 00 00 00 00". The "FF" code at the end will provide a key-down condition when the message is over. If the ROBOT gets the message, it will disable its receiver and the carrier will not be heard on the downlink while the ROBOT is acknowledging the call.

If it did not receive the CW correctly due to QRM, fading or other loss of signal then the carrier can be realigned with the uplink passband center (only a few KHz wide) for another try.

The short GW-BASIC program in Table 2 will convert the ASCII information in CODE.IN to a binary file suitable for EPROM programmers. It is very easy to make mistakes during the process of creating your own CODE.IN file. Before going to the trouble to prepare an EPROM for "burning-in", check the code in the resultant program EPROM.OUT for accuracy.

Most binary files produce garbage on the screen when they are displayed using the TYPE command. EPROM.OUT, when loaded only with ones and zeros, is an exception. The binary zeros will show up as blank spaces (the NUL or Null character) while ones represent the control code "SOH" (start of heading) which appears on the screen as a "happy face." The CW message will be displayed as a sequence of happy faces separated by spaces. Your work can be checked very quickly.

After burning in the EPROM, you can do the final checkout of the project by listening to the rig's sidetone oscillator with the ROBOT CALLER attached to the CW key line and a 5 VDC supply. The speed of the keyer seems to be ideal for the ROBOT, and using an EPROM makes it very easy to reprogram for operation with the next RS satellites, RS-12/13 scheduled for launch this year. Check the September 1989 "Hamsats" column for details and frequencies for RS-12/13. Good ROBOT hunting! ■

Number 22 on your Feedback card

HOMING IN

Radio Direction Finding

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RDFing for QRM

Unlike 40 years ago, the FCC no longer has the budget and the mandate to scan the spectrum looking for violations in the amateur radio service. As I stated last month, it is more important than ever tor us to live up to our reputation lor being self-policing. Whenever possible, we must seek to solve our own cases of careless and malicious interference without FCC intervention.

When peer pressure doesn't work, we can serve as extra eyes and ears for the FCC in the Amateur Auxiliary, gathering evidence for eventual prosecution. By adding radio direction finding (RDF) capability to your HF mobile installation, you can track down interference problems in your area.

Besides jammers, you can locate QRN sources such as noisy power lines and cable TV leakage. You don't need fancy, expensive equipment. A simple loop is all it takes for accurate ground-wave RDFing.

Build the Homer

I can hear some veteran VHF T-hunters scoffing at the idea of hunting jammers with an old-fashioned loop. It's true that loops are not competitive with beams and dopplers on 2 meter FM T-hunts. But on 15 meters, dopplers and beams are out of the question for mobiles.

There are more sophisticated mobile RDF setups for the HF bands, but how many hams are willing to spend the time and dollars to implement them just to hunt an occasional jammer? The HF Homer, on the other hand, is so simple that just about any HF mobile enthusiast can build and use it. When interference comes on, it's too late to start the project, so get the parts together and start building now.

A Combat-Proven Design

I adapted the HF Homer from a design used by the US Army in the fifties. The hand-held AT-340/PRC RDF Homing Antenna covered 20 to 39 MHz and worked with field portable receivers that were predecessors of the "manpacks" of today. Surplus AT-340s are hard to find now because they

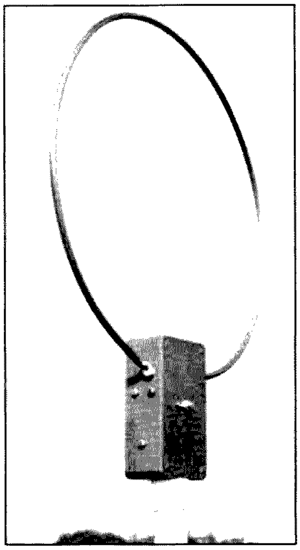

Photo A. The HF Homer uses soft copper tubing securely bolted to a plastic box, mounted on a PVC pipe mast.

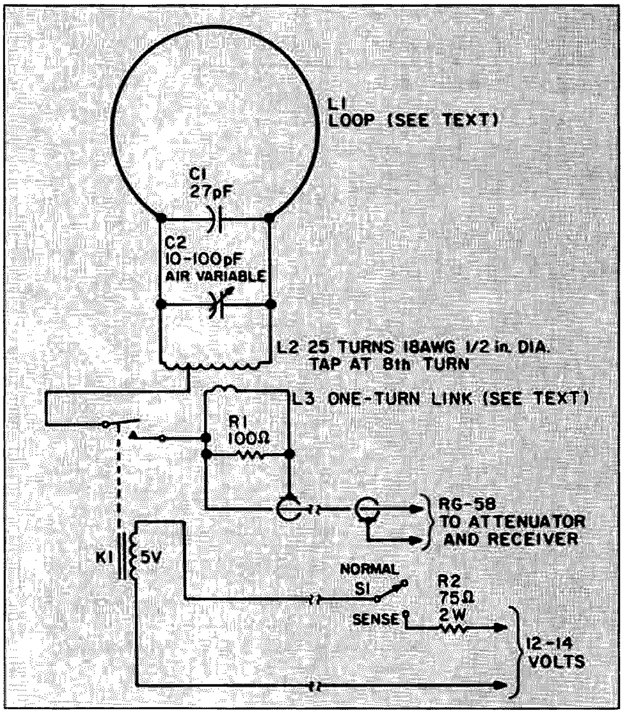

Figure 1. Schematic diagram of the HF Homer. S1 and R2 are inside the vehicle. All other parts are in the mast-mounted box.

were snapped up by hams back when 10 meter foxhunts were popular.

The HF Homer gives the same performance and ease of use as the army loop, but it has a lower frequency range (18 to 30 MHz) and it's mast-mounted for mobile hunting. The loop, shown in Photo A, is 13½" in diameter, on a mast two feet above the roof of the van to minimize proximity effects. The SENSE mode was selected by a toggle switch on the AT-340 case, but in my design, it is relay-activated from inside the vehicle.

The HF Homer is a "work-alike" to the VHF-FM Handy Tracker (see "Homing In" for September 1989). The principle of operation is different, but hunting procedures are quite similar. You get the sharpest bearing indications in the NORMAL mode, which has a figure-8 antenna pattern.

Two broad-response peaks and two very sharp nulls are indicated on the receiver's S-meter as you rotate the mast of the antenna 360 degrees.

Peak response occurs when the incoming signal is in the plane of the loop, and the nulls occur when the signal is "through the loop." Usually, you'll use the nulls instead of the peaks to determine the line of bearing. This gives two possible directions for the incoming signal, 180 degrees apart.

Closing S1 picks up relay K1 and puts the HF Homer in the SENSE mode, changing the antenna response pattern to favor one of the two peaks.

The purpose of the SENSE mode is to resolve the 180 degree ambiguity of the NORMAL mode's peaks and nulls. Once you have practiced a bit, you can take a bearing much faster than I can explain how to do it.

If you have experimented with HF loops in the past, you'll notice some differences between the HF Homer and typical ham designs. This is not a shielded loop. Many loops have a shield to eliminate the "antenna effect" and couple only to the magnetic component of the incoming signal. Such designs require a separate vertical sense antenna to resolve the 180 degree ambiguity.

The HF Homer takes advantage of the antenna effect to resolve the ambiguity in the SENSE mode by properly combining the electrical and magnetic field pickup. In the NORMAL mode, the antenna effect is canceled by property configuring the L2/L3 coupling coils. This eliminates the shield and the separate whip, simplifying construction.

To the Plumbing Store

There are no exotic parts in the HF Homer. You should be able to assemble it in an evening or two. I made the loop from ¼" O.D. soft copper tubing. You'll find it in the plumbing section of your local do-it-yourself store, intended for supplying water to refrigerator icemakers. It comes in a coil, so you won't have to form it into a circle. Cut the tubing to 39".

Use solder lugs and 10-32 hardware to mount the tubing on the 4¾" x 2½" x 1½" plastic case (Radio Shack 270-222). I soldered the tubing and lugs directly to the

Continued on page 65

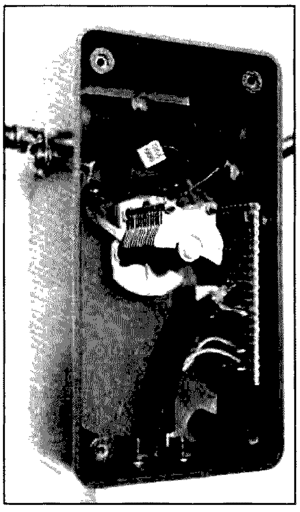

Photo B. Inside the HF Homer enclosure. Stator terminals of C1 are clipped off to make it fit in the box.

ABOVE AND BEYOND

VHF and Above Operation

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6 Meter Operation

Because of a light work schedule, I missed some 6 meter openings, but I was able to listen to others on my recorder. Hope you made a lot of contacts!

To improve my 6 meter station, I'm currently building a high power amplifier. I've obtained several used 4CS250SR conduction-cooled tubes, similar to 4CX250 (force-air cooled) ceramic tubes, for the project. Due to a hearing loss acquired in the service, I can't operate near low-frequency noise sources, such as blower motors, so the silent conduction-cooled tubes (with heat sink transfer) are quite a premium item to me.

Along with regular high voltage safety precautions, conduction-cooled tubes require special care.

Safety with Amplifier Power Tubes

Like high power RF transistor amplifiers, the tube requires a large aluminum heat sink. The thermal link of a conduction tube is the counterpart to the cooling fins on forced-air transmitting tubes. This ceramic link (insulator) used to remove heat from the conduction-cooled tube is made of beryllium oxide (BeO), a rather nasty, toxic substance. There is no problem in normal handling and use, but I recommend that you store ceramic tubes in a separate container to prevent cracking the ceramic (BeO) material.

Varian states in its literature that the BeO thermal link may be brazed to the anode section of the power tube, or it may be a separate accessory. Do not perform any operation such as grinding, grit blasting, and acid cleaning on any BeO ceramic tube which might produce dust or fumes. BERYLLIUM OXIDE DUST OR FUMES ARE HIGHLY TOXIC AND BREATHING THEM CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

Varian goes on to state that because labels may become obliterated or removed, especially on used components, you should contact your tube supplier before performing any work which might affect the thermal link (BeO). Not all ceramic components of power tubes are made from beryllium oxide, but for safety's sake, treat them as if they were.

For further information, I suggest the Varian Eimac Division's "Quick Reference Catalog" on power grid tubes and "Care and Feeding of Power Grid Tubes." You can find additional information in *The Radio Handbook* by Bill Orr W6SAI and *The ARRL Handbook*.

MMIC Amplifiers

This month's technical presentation on MMIC (Microwave Modules Integrated Circuit) amplifiers includes several examples of basic gain blocks for amateur use. These tiny monolithic wideband amplifiers are very inexpensive, operate to over 2 GHz, and provide high gain. They come in a plastic package 0.085" in diameter. In a quantity of 25, they cost less than a dollar each.

The input and output impedance of the MMIC amplifiers are 50 ohms. This differs from a transistor amplifier with variable impedance that requires impedance matching circuits on both the input and output. The MMIC amplifier does not require impedance matching circuits. In many cases the devices are connected coaxially in a circuit with minimum components forming equal, if not better, amplifiers than discrete construction. Simple power supply bypassing, DC isolation and good ground returns, reward you with a simple amplifier.

Not only are they easy to use, they are also readily obtainable from Mini Circuits in a Designer's Kit (DAK-2). Seven different MMIC devices come in this kit of 35 amplifiers and are available for $59.95. A good deal, allowing lots of experimentation for little cost. Quite a few amateurs have commented to me that they bought the kit instead of ordering separate amplifiers for projects. These devices are also available from Avantek. Part numbers differ, but I am informed that they are essentially the same device. See the Table for details.

"Not all ceramic components of power tubes are made from beryllium oxide, but for safety's sake, treat them as if they were."

MMIC Circuitry

Use of the MMIC amplifiers is quite simple requiring only an input and output coupling capacitor. DC voltage is supplied to the device with a series resistor and RF choke for bypassing and tied directly to the output of the device. The choke and current limiting resistor should be bypassed to ground with short leads. This improves gain and stage stability, helping to prevent unwanted oscillations. Additional bypass or select RFCs can improve operation at the upper frequency limits of the devices. In contrast, spurious emissions will plague you with poor supply bypassing. See the amplifier test circuit in Figure 1.

I have used these devices in so many different applications I could not keep track of them. The latest use was in a transceiver for 2300 MHz. The PC board layout was published in the North Texas Microwave Society's newsletter Feedpoint. I made a test board as soon as I saw the article. This unit uses two MAR-6 devices each in the receive and transmit amplifiers. The two amplifiers each feed one leg of a combiner which ties to a common filter and mixer, using a 2 meter HT for the IF system.

While working above their rated frequency of 2 GHz, the devices reduce gain performance, giving about 7 dB per device at 2300 MHz. What makes this PC board so exciting is that it doesn't require tuning or circuit adjustment, just capacitive input and output coupling with good DC feedthrough bypassing. (I will try to get a copy of the artwork for this project and include it in a later column.) See Figure 2 for the schematic.

Another application for MMIC devices is in oscillator multipliers. Overdriving the input of the MMIC amplifier produces an output rich in harmonics which can be bandpass-filtered, eliminating the unwanted products.

You can then use another MMIC to build up the desired harmonic power in oscillator multiplier chains. These devices will catch on in amateur applications for some time to come because of their ease in use and their varied applications.

Mailbox Comments

Henry of Garden Valley, California, is looking for information on how to construct microstripline circuits and other inexpensive test equipment for our microwave bands. Frank N6PVO is looking for a good text on microwave basics. Jay N1GBS is considering microwave for transmission of

Continued on p. 65

Specifications for Mini Circuits

Model	Freq MHz	Gain dB 100 MHz	Gain dB 1000 MHz	Gain dB 2000 MHz	Max PWR dBm	NF dB	Price Ea.	Color DOT
MAR-1	DC-1000	18.5	15.5	—	0	5.0	.99	BROWN
MAR-2	DC-2000	13.0	12.5	11.0	+3	6.5	1.50	RED
MAR-3	DC-2000	13.0	12.5	10.5	+8	6.0	1.70	ORANGE
MAR-4	DC-1000	8.2	8.0	—	+11	7.0	1.90	YELLOW
MAR-6	DC-2000	20.0	16.0	11.0	0	2.8	1.29	WHITE
MAR-7	DC-2000	13.5	12.5	10.5	+3	5.0	1.90	VIOLET
MAR-8	DC-1000	33.0	23.0	—	+10	3.5	2.20	BLUE

Prices are for quantities of 25 from Mini Circuits. Note that the MAR-8 is the only amplifier not unconditionally stable. It requires special matching to your test circuit. Mini Circuits, PO Box 350166, Brooklyn NY 11235-0003. Avantek, 101 Renner Rd., Woodcreek Plaza Ste 180, Richardson TX 75080. (214) 437-5694.

Homing In

Continued from page 60

bolts, to keep them from working loose. (Intermittents were a problem with the army's collapsible version.) Solder the bolt and lug to the tubing before fastening it on the box, so you don't melt the plastic.

The mast is ¾" Schedule 40 PVC pipe. The coax and relay control signal leads go down the inside of the pipe. Mount a ¾" slip-type PVC pipe cap to the box as shown in Photo B, using 6-32 hardware. Match-drill the pipe cap and box for the wires.

Bolt a 1" x 2" piece of unclad perfboard in the box to terminate the external leads and to mount K1 and R1. I used a subminiature relay (Radio Shack 275-240) with a 5 volt coil. That allows me to use the unit on foot with a "sniffer" that has a 6 volt battery supply.

R2 drops the voltage when I use the vehicle's electrical system. If you only intend to use the loop in the vehicle, you can substitute the RS 275-241 or another relay with a 12-volt coil, and eliminate R2.

Tuning capacitor C1, shown in the middle of the box in Photo B, must be an air variable type. Small air variables are becoming hard to find. Try your local surplus emporium or electronic swap meet.

Marlin P. Jones Company (PO Box 12685, Lake Park, FL 33403, (407) 844-8764) has a 120 pF part, stock number AV-0091, for $1.75. Measure your capacitor before mounting it, as it might be too long to fit on the side wall of the box.

Wind L2 on a ½" diameter form, with the 25 turns spaced for a coil length of 2". I used rod stock from a local plastics supplier for the form. The tap is 8 turns from the right end. L3 is a length of solid AWG 22 insulated wire formed into a single-turn link over L2. Lightly twist its leads over to K1 on the perfboard. Leave a little slack so the link can be moved along the length of L2.

You will find the exact position of L3 during alignment. In Photo B, the link is over the tenth turn from the left end, held in place with a dab of hot glue. Put yours there for starters.

You can hold the loop out a car window by hand to take bearings, but I don't recommend it. Interaction with the vehicle causes errors and it's hard to get bearings while driving. And imagine the sore muscles and wet, cold fingers you'll get on a rainy night. Make a rotating mount for the mast.

Put a 360 degree compass indicator on the mast for accurate triangulation. Set the pointer to indicate one of the two nulls.

It's hard to tell when you are looking exactly through the loop, so set the mast to indicate 90 or 270 degrees relative to vehicle heading, and visually line up the loop so the plane is exactly to the front and rear. Use bolts or glue at all PVC slip joints so nothing twists.

Besides the loop, you will need a well-shielded receiver and attenuation system, all securely mounted in the vehicle for convenience and safety.

A stable test signal for each band is a great help in alignment. A QRP milliwatt rig is fine, or perhaps you have an old VFO or signal generator. I use a TTL oscillator I built to check crystals for activity. Start the alignment on 15 meters. Be sure the vehicle is in a clear area, away from overhead wires.

First, tune the loop to resonance. With S1 in the NORMAL position (relay open) and the loop plane in the direction of the test signal, tune C2 for maximum S-meter reading. Locate the receiver so that you can see the S-meter when tuning, because you won't be able to find the exact peak by ear. Use your attenuator to knock down the signal if the S-meter reads over S9. Most S-meters are less sensitive to small changes when readings are in the upper scale.

As you rotate the loop in the NORMAL mode, there should be two deep nulls perpendicular to the plane of the loop and exactly 180 degrees apart. One of these nulls should be in the direction of your mast pointer. Repeat this check on 10, 12, and 17 meters.

If the NORMAL mode nulls are not exactly 180 degrees apart or are very shallow, the loop isn't well balanced. Experiment with the location of link L3 on coil L2 for optimum performance on the four bands.

Next, check SENSE mode operation. Close S1 and turn the mast +90 and -90 degrees from the pointer null. One or the other directions should give stronger S-meter readings on the test signal, depending on how you connected L2/L3 leads. Mark the side of the mast to indicate the strongest peak side. Check the SENSE mode on all four bands. You will probably get best front-to-back sense indications on 15 meters, because that band is closest to design center frequency, but indications will be good enough to use on all bands. ■

Continued from p. 62

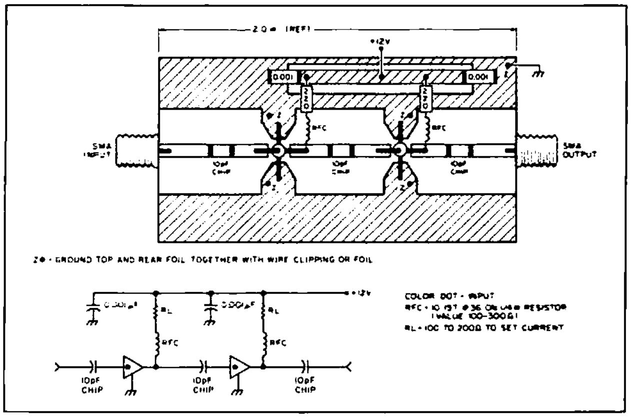

Figure 1. MMIC amplifier test circuits. You can use them as a single-stage amplifier.

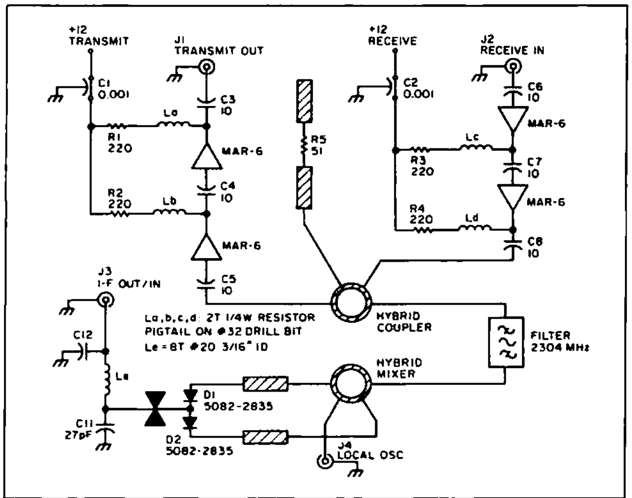

Figure 2. Design by Don Lund WAØIQN, courtesy of Feedpoint, *published by the North Texas Microwave Society, May 1989.*

higher speed packet, and looking for receivers and transmitters to build to achieve this goal. I have received similar requests for simple devices to construct that don't become "deep pocket" projects.

I can think of many projects that would fill the bill, such as my past projects in *73 Magazine* articles on wideband FM systems. These can be adapted for packet, though I haven't gotten into that myself, yet.

Several good references are available. The San Diego Microwave Group has a booklet covering our entry into wideband FM on 10 GHz. The booklet details all the projects you need to construct a station for FM, beacons, SSB operation and associated test equipment. Full schematics and some printed circuit boards are available. Cost is $15 postpaid and is available from me at the above address.

The North Texas Microwave Society's newsletter, *Feedpoint*, is packed full of up-to-date microwave projects and happenings. I always look forward to receiving it. Dues are $12 a year. For information, contact WA5TKU, Wes Atchison, Rt. 4, Box 565, Sanger TX 76266.

Another good reference book I'm very fond of is *The RSGB VHF/UHF Handbook* by G.R. Jessop G6JP. It costs about $35 and covers the full gamut of our VHF/UHF spectrum, including topics on receivers, transmitters, filters, antennas, and test equipment for frequencies from 50 MHz and up. You can buy this book at some large ham radio stores and technical bookstores. Also check *73's* bookshelf at (603) 525-4201.

As always, I'll be glad to answer any questions concerning this or any other amateur related VHF/UHF project. Please send an SASE for prompt reply. 73's, Chuck WB6IGP ■

Number 25 on your Feedback card

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Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73 Flea Market*, Barter 'n' Buy, costs you peanuts (almost)—comes to 35¢ a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to the *Barter 'n' Buy*, Donna DiRusso, Forest Road, Hancock NH 03449 *and get set for the phone calls.*

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The 21st **Annual** B*A*S*H will be held on FRIDAY NIGHT of the Hamvention, April 27th, 1990 at the Conference Center (Madison Room) of the HARA ARENA AND CONFERENCE CENTER, (the same location as the Hamvention), starting at 7 PM. There is no admission charge, and free continuous entertainment. Hot dinner, sandwiches, snacks and beverages are available. Two exciting top awards, and many others. Stay right at HARA when the Hamvention closes on Friday evening and meet your friends and join us for an evening of fun and entertainment. ANNOUNCING!! Weather permitting, there will be a hot air balloon launch on Saturday, April 28, 1990 or Sunday, April 29, 1990 at approximately 6:45 AM conducting aeronautical QSOs. Frequencies to be announced at the B*A*S*H. Special Event OSL cards will be issued. Sponsored by the Miami Valley FM Association, PO Box 263, Dayton OH 45401. BNB909

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Kenwood Corporation Service

A tour through the service department.

by Gordon West WB6NOA

When you deal with Kenwood USA Corporation, you are dealing with one *big* company. As Joel Berger WD6BQD, Kenwood's National Service Manager, took me on a scheduled tour of the service department, I noticed the professional manner in which they greet customers bringing equipment in for repair. However, as with ICOM, Yaesu, and other large manufacturers of amateur gear, the fact that you brought it in doesn't mean it's going to get fixed while you wait.

Craig Martin KR6T, Kenwood's Customer Service Manager, offers *73 Magazine* readers the following tips on securing fast Kenwood service for 1990: "Whenever someone calls our service department, they will be greeted by a message providing them with options so that they will be able to contact the appropriate department. Should the customer wish to talk with a technician, he should select the technical department. Customers can be freely transferred from service to parts to sales, etc. Please also note that we operate on Pacific Standard or Pacific Daylight time. Our hours are from 08:30 through 17:00 Monday to Friday, excluding holidays."

Touring Kenwood's Service Facility

In addition to ham radios, the company services business radios, audio equipment, car stereos, and marine equipment, in separate sections. About 10% of the personnel are Japanese; most are American. Surprisingly, everyone is trained to work on many types of rigs. They're all knowledgeable, but there's always someone who's a real specialist on a particular type of equipment.

Kenwood has 35,000 parts to support the needs of the service department. The parts go back for up to 10 years, so even old Kenwood sets can be repaired, though tubes are a problem. Quality 6146B tubes are no longer available in the US, and Kenwood 510 and 511 sets are still operating. If you have one of these older sets, stock up now on the tubes. If you have an early Kenwood handheld, let a local battery store rebuild your NiCd pack. This will save you time and money in the long run. There's nothing magic about older Kenwood battery packs. Be sure to bring in the old pack so the battery rebuilder can see where the wires hook up.

Kenwood was quick to point out their team approach to fixing equipment properly and quickly. Berger: "It's your hobby, but it's our business." The Kenwood amateur radio repair technicians, nine total, enjoy providing good service for your

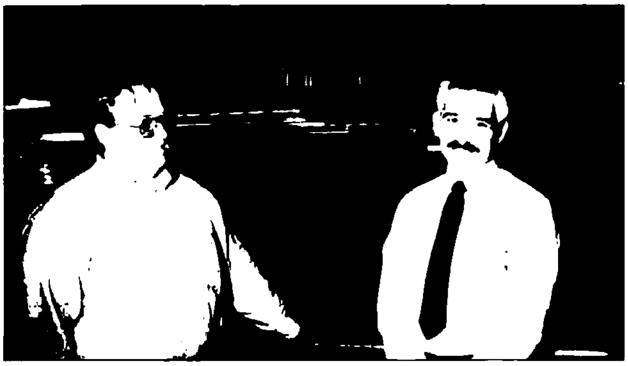

Photo A. Kenwood's top service men: Craig Martin KR6T, the Customer Service Manager (left), and Joel Berger WD6BQD, the National Service Manager (right).

Photo B. A Kenwood test bench with ultra-sophisticated test equipment for hard-to-trace malfunctions.

Photo C. Maria KC6ABM (Anti Ballistic Missile) at the Kenwood employees' ham club station.

equipment. And they are hams, too.

One of Kenwood's enthusiastic employees, Maria KC6ABM, set up a successful amateur radio class for visiting Japanese hams who wanted to get their US licenses. Maria is regularly on the air from Kenwood's deluxe base station console that's open to all hams wanting to do a little rag-chewing during lunch (see Photo C).

All repair records are kept on computer. Berger: "This is usually detailed on the work order included with the fixed set." As a ham, I like to see exactly what they did to fix it.

It seems a shame that quick, emergency repairs are not available. Some hams, getting ready for a big trip, might pay up to three times the normal repair rate to get their sets fixed quickly, but none of the manufacturers offer quick fixes at higher rates. However, equipment that comes in for the same problem a second time is pushed ahead of the line. Also, Kenwood does provide priority on returns at no additional charge.

Common Service Problems

These vary from unit to unit, but a brief breakdown might be:

- •Handhelds—Dropped unit/improper charger
- •VHF Mobiles—Reverse polarity/front-end overload
- •HF Mobiles—Reverse polarity/salt water damage/front-end overload
- •HF Base Units—Front-end overload/lightning strike/bad finals (from high SWR or trying to run too much power)

In addition, problems may be due to improper connections, such as using a wrong jack.

Out-of-Band Procedures

Martin: "We will repair all Kenwood radios regardless of the modifications as long as you provide a description of what the modification does, how it is controlled, and how it was accomplished. We will not fix your modification! If it is determined that the problem is caused by the modification, it might be necessary for us to disconnect the modification in order to complete the repair. We will not attempt to reconnect it even if we have the instructions! We will also not fix transmit problems outside of the normal ham bands. This includes MARS, CAP, and especially CB modifications."

Sending in Your Unit

According to Martin, one of the most common problems with the customer

sending in his unit is "Inadequate packaging. Please use the original box and packing. If they are not available, use a heavy double wall cardboard box that provides approximately 6" of packing material on all sides. DO NOT USE CRUSHED NEWSPAPER FOR PACKING MATERIAL!!! Use styrofoam beads and add cardboard buffers to prevent shifting of the contents with heavy units. Send only one unit in each box! Don't try to save $10 in shipping charges only to cause $150 in shipping damage. We recommend shipment via UPS since the USPS can take up to one year to settle a claim for a damaged or lost shipment. Also, no description of problem, no return address, and no phone number are problems."

Berger: "It is not necessary to call us before shipping if you follow the recommended shipping instructions. Before sending in any radio for service, take time to sit down and reread the operator's manual to make sure you don't just have a control or switch in the wrong position!"

Making Repairs

A Kenwood service technician says, "Service warranty is 30 days parts and labor. It's not hard and inflexible. We allow a reasonable grace period."

Average repair costs run $45 per hour plus parts. Handhelds and VHF mobiles average an hour; HF mobiles, 1-2 hours; HF base, 1-3 hours; old tube rigs, 2-4 hours; and large accessories, 1 hour. The charge for small accessories may be parts or labor.

Average turnaround time runs from 5 to 10 working days (this does not include weekends or holidays!).

All warranty repairs MUST be accompanied by a photocopy of the bill of sale. The warranty card is not required for service under the warranty, however Kenwood does encourage the timely submission of these cards.

All accessory items, such as microphones, filters, tone boards, etc., must be obtained from the dealer.

The customer has the choice of sending the unit to his dealer, to one of the outside service agencies, or directly to Kenwood. There are 66 dealers and five outside service agencies.

The Kenwood Bulletin Board

Kenwood has established a bulletin board system (see the Table) for customers. The system, capable of working at 2400 baud, is up from 17:00 to 08:00 the following work day. Current files include most service bulletins, general ham notes, sample computer control programs, some ARRL bulletins, input from *Westlink*, etc. Users are granted full access when they first sign on.

Kenwood encourages you to download as many programs/files as you might find useful. If you have a file that you think might be useful to others, please feel free to upload it.

Martin: "If you have a technical question, leave a note to the SYSOP or leave a general note for all. We are confident that you will have an answer shortly (usually the next work day, if I have the information!). New product announcements will be made here as soon as they are released by our sales department. We think this is the best way to get and pass along technical information about our products in the future, considering the number of computers in ham shacks these days.

"Future plans for the board will include 24-hour access and multiline inputs as the number of users increases."

Readers Respond

I was impressed with Kenwood's interest in letters from dissatisfied customers. They are eager to work with customers and take the steps necessary to streamline the service procedure.

Unfortunately, intermittents and recurring failures happen, generating "nasty grams." Sometimes recurring problems originate at the ham end of the picture—front-end overload, poor grounding techniques, and the like.

Here are some responses from *73 Magazine* readers:

Emmett Foster KA6MJC: Satisfied with Kenwood service after 4 attempts to get a TS-940 fixed. Kenwood finally replaces.

Jim Welch KK6N. Satisfied with local dealer repairing his Kenwood product.

Carl Schworer N2EOQ: Unhappy because not compensated for an unrepaired set returned "inoperative."

Bill Alber WA6CAX: Delighted with quick turnaround of Kenwood handheld (less than 2 weeks).

Paul Dobosz K8PD: "Quick turnaround—problem fixed—technical service personnel were helpful on the phone and set (TS-120) came back fixed within 2 weeks."

Peter Eaton KH6HBZ: HF mobile quickly repaired, but says, "My main gripe is that the factory always says they've never heard of that problem before."

Stan Podolski KA2BUG: His radio repair was delayed because he first went to a local Kenwood dealer that was not able to repair the set after 3 weeks of bench time; he feels most dealers should say when the repair is too much for them and get the set off immediately to the factory.

> *". . . everyone is trained to work on many types of rigs."*

Richard Booth AB4LG: The actual defect was never identified, but the problem was cured promptly. "Personnel on telephone were extremely courteous. Company stands behind warranty."

William Hess W3RIK: His 940 was finally repaired after the third time. "For a $2,500 unit, to have to spend $46 out of pocket for something not my fault is ridiculous." Bill sent along a detailed letter of his service problems.

Twenty other questionnaires were returned—evenly mixed between liking and not liking Kenwood service. The biggest problem seemed to be their inability to communicate with the factory directly by phone. The new Bulletin Board System should help, and both Martin and Berger believe their new phone system may eliminate this problem for good.

Regional Kenwood Service Centers

Kenwood is promoting a professional "get it fixed, fast" plan that has served the commercial land mobile radio industry for years—regional service centers.

Kenwood Service Centers are authorized for free warranty repair of amateur radio transceivers, plus the quick repair of ham sets that are old and out of warranty, at about the same repair charges as if you had sent it directly to the factory.

Berger: "Our customers that may need an immediate overnight, quick fix of a transceiver may wish to contact their local area Kenwood Service Center." Joel points out that all "KSCs" have a good supply of Kenwood parts, a full complement of Kenwood service manuals and up-to-date service bulletins, and most important, qualified personnel that know Kenwood ham transceivers inside and out. "One of our KSCs, Land Air Communications, specializes in the restoration of early Kenwood transceivers, such as the popular Kenwood 'Twins' (transmitter/receiver sets). I mean, Land Air Company makes it their evening and weekend business getting old Kenwood sets back on the air, even if they have to create some no-longer available components!"

Going on a long cruise next week, and discover your TS-440 has an intermittent display? That local KSC in the next town or state knows about the problem and has a service bulletin that may let him fix it within a couple of hours by replacing a plug-in digital logic chip with a new chip that solders in.

But I can hear your resistance to a service center already—are KSCs really as good as factory personnel? Do they have the necessary parts on hand? Are the rates the same, or lower, for most repairs? Is there a ceiling on the maximum amount they might charge you to get a set fixed? Will they honor a warranty claim when the set was not turned on until after the warranty ran out?

Berger: "Most authorized Kenwood amateur radio dealers provide full service support. Kenwood always suggests you contact the dealer from whom you purchased your unit for fast, courteous service."

Independent Service Centers

In addition, Kenwood also supports a growing group of dedicated service professionals. Why go with an Independent?

All Independent Kenwood Service Centers are fully authorized by Kenwood, and most Service Centers have a radio technician who is Certified Factory Trained by Kenwood USA Corporation. These professionals handle service for your region. Why send your radio cross-country? Less transit time means less wear and tear on your radio, and lower shipping charges. Since they are service-only specialists, they are not the "back room" at a radio store.

Independent Kenwood Service Centers can expeditiously service units both in and out of warranty. All Kenwood servicers (independent, dealer, or factory) use genuine Kenwood parts. It's a hard and fast rule! Full details on the Kenwood USA Service Network are available on the Kenwood BBS (see Table 1). Go to Bulletin Menu, then Bulletin #1. Or contact Kenwood USA Corporation for a current "amateur radio service listing."

ICOM also offers regional repair centers as an alternative to factory service. Yaesu is planning to take advantage of outside service specialists.

And for the rest of the professional communications markets, regional service centers have well established themselves as being one of the best places to send your set.

Stay tuned! Next month we visit the ICOM America Service Department. ■

Kenwood Telephone Information

Parts:	(213) 639-9000, Ext. 422 or 429
Service:	(213) 639-7140
Status Checks:	(213) 639-9000, Ext. 266
Sales Information:	(213) 639-4200
Bulletin Board:	(213) 761-8284 (8 data, no parity, 1 stop bit)
Hours:	From 08:30 through 17:00 Monday to Friday, Pacific Standard or Pacific Daylight time, excluding holidays.

Independent Kenwood Service Center Specialties

United Radio, Syracuse NY. (315) 446-8700.: Kenwood amateur VHF and UHF radio products; no HF service at present.

Land Air Communications, Richmond Hill NY. (718) 847-3090. Any Kenwood amateur radio product in or out of warranty, including vintage models.

Ham Radio Repair, Kennesaw GA. (404) 422-1415: Fix any Kenwood amateur radio product in or out of warranty, but usually not handhelds. Please call first regarding handheld service.

Robert Hall Electronics, San Jose CA. (408) 729-8200; GE Electronic Services, Bensenville IL. (312) 592-4343; Resource Electronic Corp (201) 772-1279, Radio Systems Inc. (404) 449-4150, Groton Electronics (508) 448-3322: Any Kenwood amateur radio product in or out of warranty.

Never Say Die

Continued from page 4

didn't want to miss out on the fun of selling. So I've got her rigged out with a home computer networked to WGE. She's having a great time selling from home . . . and has almost doubled her sales over last year.

Golly, it's tough working in New Hampshire where the air is clean, the summers are cool and the skiing great in the winter. The view from the WGE building is breathtaking. We're the only major business in Hancock. Heck, even the housing prices have been coming down recently.

The next town over, Keene, is a great resource, with seven movie theaters . . . frequent live music performances . . . and Keene State College.

I hope you didn't miss the recent Tom Peters "Thriving On Chaos" series. He and I agree that progressive firms run best with an absolute minimum of management. Our motto is, "If it ain't broke, fix it anyway."

Greener Pastures

How'd I ever get into the record business? It's just one of those things that was bound to happen. It could happen to you, if you're open to new opportunities.

When I saw *The Sting*, I heard Scott Joplin's ragtime music and said, hey, where's this been all my life? I bought every Joplin record I could find and played them day and night for months. The more I listened, the more I could sense the music Joplin had written, but the performers were missing. It was frustrating.

As the publisher of *CD Review* I met many record company presidents. I kept telling them to find someone able to actually feel Joplin's music and make it available. None of 'em did anything about it.

Joplin's music is extremely difficult to play. It takes an experienced concert pianist to handle it. Every time I'd meet a noted concert pianist I'd ask if they could play Joplin. I struck out.

Then, last year, I was in New Orleans for a music conference and happened to walk by a dingy little bar late one night. Ragtime piano music was pouring out the open door. I stopped in my tracks. I listened. Holy moly, who's doing that?

A couple hours later I'd signed Scott Kirby to record Joplin's music. Scott, a college graduate with concert piano training, was playing Joplin all day on the streets of New Orleans with his piano on wheels and at night in The Grapevine bar.

I brought him to New Hampshire, where we recorded his first CD release on a concert grand Steinway piano in the Peterborough Unitarian church. The piano was excellent and the church acoustics outstanding.

But Scott wasn't satisfied. The sound was good, but it wasn't perfect. So with the help of my ex-bookkeeper, Knud Keller KV4BB, now a piano repairman, we found an 1896 Bradbury and an 1898 Steinway. Both were upright concert grand pianos . . . the same as Joplin would have used when he played the music. The Bradbury was ideal for the ragtime dance pieces and the Steinway perfect for the Joplin concert pieces.

We converted the garage at my farm to a studio. Knud, who used to be a concert pianist, restrung the Steinway bass strings and then Scott set about getting used to the pianos. He played night and day for over three months, recording the results only when he had everything perfect.

The recording equipment and techniques were state-of-the-art, using the newest Panasonic 3500 DAT recorder and an AKG stereo mike. The sound is absolutely incredible, thanks to David Torrey, our sound engineer and data processing guru. He's also the brains and sweat behind our CD-ROM project.

The first CD release is out (GP-01), if you'd like to find out what all the fuss is about. It's available from Music/NH for $18 (plus $3 postage/handling). It's also available on cassette for $10 ($3 P/H). You can hear for yourself why I rate Joplin as the greatest composer America has ever produced.

There are 64 known Joplin works. We expect to have 'em all available by the end of this year . . . as boxed sets of CDs, DATs and cassettes.

So that's how I get into new ventures. Now we're planning on doing some bluegrass using our biaural recording technique. And if I can make the right connections, we'll probably be recording outstanding Eastern European artists so we can help them survive the change from communist systems to democracies.

Participation in new ventures such as Greener Pastures is open to anyone at WGE who's interested, so there's no limit to what one

can learn or do here. I prefer not to coddle drug addicts . . . and that includes alcoholics and smokers.

One disappointing aspect of being successful is that there are publications which generate attention by throwing dirt . . . and seem to have no respect for truth.

Almost Upset

When I read in *Insight* magazine that the Commerce Department was getting ready to do an end run around the FCC, I almost got upset. The department's National Telecommunications and Information Administration (NTIA) is planning to review the present system for allocating the nation's airwaves. The study will even look into the possibilities for raising revenues through the auction or leasing of frequencies.

Well, I've been warning you that something like this could come along . . . and you've been snickering and pooh-poohing it as doom and gloom. I've been griping that the feeble amount of public service we provide these days would never stand any honest inspection as justification for the hundreds of billions of dollars in frequencies we've been allocated . . . and 99% of which we haven't even bothered to use.

Between cellular phones, high definition TV, personal communications networks (PCN) and other already known developing communications systems, the need for radio spectrum is going to be a hundred or even a thousand times larger than it is right now. Fibre optics will help improve office and home communications, but if you're going to set up a system where people will be able to communicate from anywhere . . . walking, driving, shopping, even in the movies . . . we're talking radio spectrum.

One of the last things we need is for some government agency to do an honest evaluation of the radio frequencies and balance actual public service against the current spectrum allocations. All our posturing and exaggerations about the enormous value of amateur radio could be mercilessly exposed. We might even have to stop fooling ourselves and come to grips with what we've allowed to happen to what was a few years ago a very valuable national resource.

Right after seeing the *Insight* article, I read a ham newsletter report which pointed out that the FCC has gotten so fed up with the complaints about the mess on 20m created by KV4FZ, IARN and others, that they're considering ending all phone patches and even ham news broadcasting.

I got to mulling over what's gone wrong with amateur radio. How come we're no longer self-policing? We've bragged for years about how we're the only self-policing radio service, yet whenever we have any problems the ham reaction has been to immediately go crying to the FCC or a congressman for help.

The more I thought about it the more aggravated I got. Heck, I almost got mad. No, I didn't get mad at the FCC . . . that's a real waste of time. And I didn't get mad at the Commerce Department which is promising to do what the FCC should have done anyway. No, my irritation was with our beloved ARRL. I'll tell you why.

For some reason I was put in mind of a long ago incident in New York. Kitty Genovese was being brutally murdered and was screaming for help. She upset the whole neighborhood. They looked out their windows and saw her being murdered, so they pulled down their shades. They turned up their TV sound to cover her screams. They didn't want to get involved.

We've been having little murders in amateur radio (apologies to Jules Feifer) and not only have most hams been turning a deaf ear and a blind eye so as not to get involved . . . much worse, our only national amateur radio organization has also not been getting involved.

Little murders . . . like the Southern California 220 mess . . . ham suers . . . DX pileups and jamming such as the recent apparently lousy operating from Bouvet . . . bad language . . . emergency net jamming . . . repeater jamming . . . gratuitous nastiness on the air and in some ham publications I could mention . . . complaints to the FCC . . . irresponsible rule change proposals . . . making it unpleasant for kids to attend ham club meetings . . . crooked VECs.

I can almost understand why individual hams have wimpily allowed these murders. But how come the ARRL hasn't accepted the responsibility to provide leadership and guidance for amateur radio? Is the ARRL a wimp too? When it started to become clear that our self-policing was failing, where were they with a fix? Where have the ARRL Official Observers been when we have had net jam-

ming . . . bad language . . . and so on? Has the League organization just sat there, limp wristed, afraid to get involved?

When it is becoming ever more clear that leadership is needed, where has the ARRL been? Have they been too wrapped up with their new commercially built ham station . . . with planning a $10 million museum . . . with proposing major rule changes to the FCC without consulting the membership (or even the directors)?

I can understand why 99% of the amateurs wouldn't want to get personally involved with trying to do anything to help amateur radio . . . being a wimp, unfortunately, is human nature. But how come our national society . . . our *only* national ham organization . . . has so seriously abrogated their obvious responsibility?

As I say, I darned near got mad. It was close . . . but I didn't want to chance giving the totally erroneous impression that I'm attacking the League and again find myself being burned in effigy at National ARRL Conventions. Heck, for many years the League refused to let me buy a booth at their conventions or to allow the convention committees to let me talk.

Perhaps, if we started looking for non-wimp directors to elect? How about looking for some directors who have actually accomplished something in life more than working their way slowly up through the League hierarchy? How about looking for directors who have some real accomplishments? Of course if you feel better electing hand-wringing wimps who haven't the guts to provide the leadership which is so desperately needed right now, that's your choice.

Fortunately I don't feel strongly about this . . . I just thought you might want to think about it. Probably not.

Should We Sue?

Yes, I know I'm out of step with society. I'm the guy who speaks up when I see something wrong. It's gotten me into all sorts of trouble all my life . . . but I can't stop. Perhaps it's a defective gene or something . . . maybe terrible early training.

I've found myself almost exasperated at the SoCal hams who for years have put up with the worst repeater mess in the entire country in pained silence. They whine that the bad guys are too strong, so the good guys are afraid to really say or do anything about it.

When I hear bad operating I put on my Lone Ranger hat and charge into the fray. I let 'em know what I think in no uncertain, but not profane terms. Meanwhile I hear almost everyone else wimping out.

You know, if you'd stand up for what you know is right, we'd get rid of the garbage on our bands in short order. We have a hobby which has an incredible potential for benefiting both our country and the whole world . . . if we would run it right.

Here we are, with the potential for developing a fantastic array of new communications modes . . . modes, many of which will have to depend heavily for their success on our currently unused microwave spectrum allocations . . . and we're arguing over code vs. no-code and other deck chair on the Titanic re-arranging.

If amateur radio is going to be of value to our country . . . if it's going to warrant the extravagant frequency spectrum allocations we've inherited from the early hams who really did pay their dues . . . who did fulfill the bargain in Part 93.1 . . . we've got to make some major changes and make 'em fast. And, lacking any discernible leadership from Connecticut, maybe it's almost time for us to stop waiting for help from mama and go out on our own.

In exchange for billions of dollars in frequencies we agreed to provide a source of technically trained people for our country which will be of value in time of war. Fine, we did just that in the 1940s when 80% of all licensed hams joined the armed forces. We hams helped substantially to win that war . . . a war in which electronics turned out to be a deciding factor. I know because I was one of them.

My ham receiver went to the government for use by the Rubber Development Corporation in Brazil. And I joined the Navy as the electronic technician on the *USS Drum* and helped sink quite a bunch of Japanese ships.

Today you won't find the military much interested in attracting hams. The average level of ham electronic education today is so pitiful it's irrelevant. Indeed, the level of ham technical education compared to the state of the art today is pathetic compared to what we provided the government in the 1940s.

For instance, when I publish

simple, basic technical articles in *73* I get screams of anguish from the older readers...too complicated! Way over our heads!

Amateur radio, if it is to live up to its mandate as expressed in our rules, needs to make some major changes. Every one of us needs to take an interest in continuing our electronic education and building our communications skills. Calling in on some net every week doesn't cut it. Rag-chewing several hours a week isn't it. Making DX pileups worse isn't it, either.

How much have you learned about packet radio? Did you grumble in frustration when we devoted a whole issue to packet? Or did you say, hey, lots of ops are having a ball with this, it's time for me to find out what it's all about?

Sure, you're going to have to learn something about computers and build some new operating skills to use packet. Ditto if you're going to do some operating on Oscar, RTTY, SSTV and so on. Every time you conquer a new mode you're going to find yourself that much more excited about amateur radio...and proud of yourself for the new skills you've built.

If you get off dead center and try new modes...if you lend a hand in cleaning up the garbage infecting our bands...if you start bringing youngsters into our hobby and making it fun for them...if you stop waiting for Godot to turn up and tell you what to do...you'll help make amateur radio not only a more exciting hobby for the rest of us...you'll have the time of your life. And, best of all, you'll look forward enthusiastically to an honest evaluation of the value of amateur radio when a Commerce Department or FCC survey is in prospect.

Japan, with over twice as many licensed hams and half our population, has been running circles around us. I haven't found any industry people who don't believe that this has had a lot to do with America losing all of its consumer electronic industries to Japan. Fellas, we did that.

The sooner we recognize that we have no leader, that the responsibility for our existence lies with each of us, not with a small group in Connecticut whose main interest is publishing, the sooner amateur radio will blossom.

Alas, we tend to mystify The League. If you take the trouble (and expense) to send for the yearly League financial report, you'll understand it much better. All you have to do is follow the money. You've heard that before, right? Well, most of the ARRL's money comes from publishing...from *QST* subscriptions and advertising, so that tends to wonderfully concentrate their attention.

Sure, we'd do better with some strong leadership, but we know what we should do, so we can do just fine without it. We know that every one of us should be building our communications understanding and experience...that we should be vigorously going after youngsters and building our ranks...that we should be pioneering new technologies.

With the winding down of the Russian military threat, it's all the more important that amateur radio do everything possible to help our country get back to number one in electronics in the world. You see, without that threat the mighty American military machine will tend to fade away and that might deflate our arrogance as we begin to recognize that America is no longer the most important country in the world.

Without our military might, and with Japan...and perhaps Germany...beating us industrially and financially, we could find ourselves in the position Britain did when it lost its empire and stopped being "Great" Britain.

ARRL President Urged To Resign

Entirely coincidentally, after writing the above indication of my annoyance, I've learned that five well-known hams have asked Larry Price W4RA, the ARRL president, to resign. They cited that he had failed to "adequately meet either the domestic or the international challenges that face amateur radio today, and that a change in ARRL leadership is absolutely necessary if we are to survive these challenges in the coming decade."

So here we have heard the same basic complaint from Stu Cowan W2LX, the publisher of a wide range of ham books; Pete Hoover W6ZH, son of Herb Hoover Jr., a past president of the ARRL and grandson of president Herbert Hoover; Joe Schroeder W9JUV, the past publisher of *Ham Reports*; Prose Walker W4BW, a past head of the FCC's amateur radio division; and Bill Orr W6SAI, one of those who greatly helped ram through incentive licensing 25 years ago.

They blame Price for the League's financial crisis, for fail-

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QSL of the Month To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock NH 03449. Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

ure to take a leadership position on a long list of domestic situations, for failure to adequately prepare for the coming 1992 WARC, and for being abrasive and hard to deal with, causing poor relations with both the IARU and FCC.

I suppose that my complaint about the lack of leadership does come down to the president. My solution, knowing the virtual impossibility of changing presidents, was to suggest that perhaps it was time for us amateurs to just go ahead and solve problems ourselves.

Of course it's beyond our purview to deal with the IARU alienation and its ramifications. It's a little late for us to start doing the massive international homework needed to protect our amateur frequencies at WARC in just two years. When one remembers, as I do since I was there as an official delegate representing amateur radio, how close we came to losing amateur radio almost completely at a past WARC, I'm wondering why the angry five didn't file criminal charges against the ARRL directors for their paralysis in allowing the situation to get so bad.

The five hams who've attacked Price have one thing in common. All are keenly aware of what's going on at all levels. They have the industry, FCC and international background to know what has been happening . . . and what should have been done.

Repeater coordination battles have been permitted to escalate to the FCC level. Ditto third party traffic problems, hurricane and earthquake disaster communications problems and electromagnetic radiation questions. And suing the FCC hasn't helped improve relations either.

The unanimity of five key hams urging Price to resign should be enough to convince all but the most dense ARRL supporters that there really are problems and that this isn't a case of Wayne or others "attacking the League for some frivolous reason." If you're not worried, then you don't understand what's going on . . . and you are part of the problem, not part of the solution.

Many other industry leaders would speak out if they weren't afraid of League retribution. They are quite vocal at ham industry meetings, but fear of the League's power, which is considerable, keeps them quiet. Remember too, that all our largest ham industry firms are Japanese, and that they tend to avoid interfering in what they see as our American domestic problems.

Well, you may not want to personally do anything, but at least I've given you something to talk about on the air other than the model number of your rig. ■

Number 30 on your Feedback card

73 INTERNATIONAL

edited by C.C.C.

Arnie Johnson N1BAC
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Notes from FN42

New Hambassadors

Good news for all of us. Two new Hambassadors have joined the ranks of 73 International.

Phil Gray KA7TWQ, while working with CARE in Mozambique, has volunteered to keep us up to date with the happenings there until a Mozambican ham is discovered or comes forward. I'm certainly looking forward to his reports. A short one is in this column.

Jonas Paskauskas, head of the Siauliai club station LY2ZZ, has been persuaded (didn't take much) by Paul Pauliukonis KB1TY to pass on the latest information from the Baltic Republic of Lithuania. We are probably all aware of the recent political status of Lithuania and the USSR, and changes are being made on the ham front as well.

TRAVELING TO THE EMERALD ISLE

Many of you are probably a lot like me: I enjoy traveling, seeing new sights, and hamming on the way. I was fortunate to be able to travel to Ireland, Scotland, and England last summer with my family, but without ham gear.

By the time the plans were finalized, it was too late to send off for approval to operate in the British Isles. I really felt lost without an HT in my hand.

We traveled mostly by bus with 30 other people, except for the short flight from Dublin, Ireland, to Glasgow, Scotland, and the train from Edinburgh, Scotland, to Birmingham, England. Now that I think back on this trip, it is the first time in many, many years that I was not doing the driving, and I took full advantage of it.

I had lots of time to view the wonderful scenery, the stone fences, castles, and houses with thatched roofs, many built long before the USA was even a colony of the British Empire. I even kissed the Blarney Stone and gained the "gift of eloquence." I've had some people say that I'm full of Blarney, and maybe they are right.

I also found myself looking at the roofs and backyards of the houses for signs of ham antennas. I don't remember seeing many, but I know there are many hams living there. I vowed that if I ever returned or traveled to other countries, I would apply for a license to operate and take a radio with me.

I got my wish! My wife and I are planning to take her mother to see her family in Ireland. The trip will probably occur between May 30 and June 14. There will be a few free days and evenings during the tour.

I plan on operating 2 meter HT bus-mobile. Maybe someone can advise me on whether I need to practice whistling up repeaters, get a tone generator for my trusty IC-2AT, or need do nothing special to bring up the repeaters in Ireland.

The itinerary includes evening lodging in: Ennis, Killarney (2), Waterford (2), Dublin (3), Rossnowlagh (2), Galway (2), and Dromoland Castle, with traveling between and around.

I am really looking forward to the return trip to this beautiful country. If any of the hams of the Emerald Isle would like to get together with me during my trip, please contact me at 73 Magazine *(mail or BBS), at my address at the top of the column, or via PACKET,* N1BAC @ W1FYR.NH.USA.
—Arnie, N1BAC

ROUNDUP

Japan From the JARL News:
New "WARC '79 AWARD"

From the 10, 18, and 24 MHz allocated to amateur service at WARC (World Administrative Radio Conference) '79, the latter two, i.e., 18 MHz and 24 MHz became exclusive for amateur radio use on July 1, 1989.

Commemorating this, JARL decided to start a "WARC '79 Award" to encourage the active use of the bands. Applications will be accepted as from February 1, 1990.

The essential requirements of application for this award are as follows: to make contact with at least 79 stations (one station from each of the 10 areas in Japan must be included) at more than one or two bands among 10, 18, and 24 MHz on the amateur bands, and obtain a QSL card from each (at each contact from July 1, 1989 through December 31, 1990). As it is an award of commemoration, an issue number will not be given.

All Asian DX Contest

The All Asian DX Contest '90, an international contest under the auspices of JARL, will be held as per the following schedule: Phone from 00:00 June 16 to 00:00 (UTC) June 18, CW from 00:00 August 25 to 00:00 (UTC) August 27.

South Africa From SARL Headquarters: In a dramatic meeting held on Friday, December 8, 1989, the Radio Sport Verband (RSV) abolished the ban against a range of countries. The radio amateurs in the German Democratic Republic (GDR) are now permitted to communicate with ALL other licenced amateurs in the world.

The German Democratic Republic was one of the first countries in the world to introduce a politically motivated ban against South Africa's radio amateurs. In South Africa any person may pass the radio amateur examination. Visitor permits are available on application to foreign amateurs of all countries. South African amateurs are permitted to communicate in all languages and are not restricted to communicate with amateurs of any country.

The South African Radio League recently appealed directly to the government of the German Democratic Republic and the Radio Sport Verband to abandon the prohibition. The radio amateur service in South Africa is hopeful that other countries follow the example of the German Democratic Republic and free the amateur service in their respective countries from any political interference.

Sweden From *Radio Sweden:* **Publications**—Bengt Friedewald has finally published

Calendar for April

1—Youth Day, Benin; April Fools Day, USA
2—Hans Christian Anderson, 1805; Emil Zola, 1840; Malvinas Day, Argentina; International Children's Book Day
3—National Day, Guinea; Ram Navami, Hindu
4—Anniversary of the Liberation, Hungary; Independence Day, Senegal
5—Arbor Day, South Korea
6—Victory Day, Ethiopia
7—Woman's Day, Mozambique; World Health Day; Founders Day, South Africa
8—Buddha's Birthday, Japan; Palm Sunday
9—Charles Baudelaire, 1821; Paul Robeson, 1898; National Day, Sierra Leone; Hanuman Jayanti, Hindu
10—First Day of Passover, Jewish
11—National Heroes Day, Costa Rica
12—National Redemption Day, Liberia; Holy Thursday; Jeudi Saint
13—Good Friday; Vendredi Saint; Thomas Jefferson, 1743
14—Pan American Day; New Year's Day, Bangladesh, Nepal, Burma
15—Easter Sunday; Anniversary of Military Regime, Niger
16—Easter Monday; Queen's Birthday, Denmark; Wilbur Wright, 1867; Charlie Chaplin, 1889
17—Evacuation Day, Syria
18—Independence Day, Zimbabwe
19—Republic Day, Sierra Leone; Constitution Day, Venezuela
21—Tiradentes, Brazil; Queen Elizabeth II; Feast of Riduan, Bahai
22—Vladimir Ilyich Lenin, 1870; National Secretaries' Week, USA; International Earth Day
23—Serge Prokofiev, 1891; William Shakespeare, 1564; St. George's Day, England
24—Victory Day, Togo
25—Liberation Day, Italy, Portugal; Anzac Day, Australia, New Zealand; Meenaksi Kalyanan, Hindu
26—Union Day, Tanzania
27—Arbor Day, USA; Samuel F.B. Morse, 1791; National Day, Afghanistan, Togo; Last Day of the Month of Fasting, Ramadan; Teej, Hindu
28—Id al-Fitir; Kenneth Kaunda, 1924
29—Emperor's Birthday, Japan; Shanka Jayanti, Hindu
30—Independence Day, Israel; Queen's Day, Netherlands; King's Birthday, Sweden

the new edition of his "International Listening Guide." The issue covers the period until March 24, 1990. It lists external and home service broadcasts in English to all parts of the world by time, and is an excellent reference. It also includes a detailed database by frequency showing which stations are on the air at various times.

This is the same as the heart of *Passport to Worldband Radio*. The latter's tables are easier to read, but the *ILG* is much cheaper, and is to be updated regularly. Assuming the *ILG* resumes regular publication, Radio Sweden recommends it and the *World Radio TV Handbook* as the best SWBC reference works. For more information, write: Peacewood Publications, Box 1112, D-3588 Homberg, West Germany.

Switzerland International Telecommunication Union release:

Take-off of Mass Telematics

The 1990s will be marked by the take-off of a fifth 20th century mass medium following the newspaper, cinema, radio and television, namely mass telematics, also known as videotex. After ten years of infancy and battles over international standards, mass telematics will connect millions of users through the telephone and terminals smaller that PCs or microcomputers.

As the first medium based on both telecommunications ("tele") and informatics ("matics"), telematics has already started to upset the norms of mass communications and the management of everyday tasks. Its three features make it a more utilitarian medium than its four predecessors, one less leisure-based and far easier to integrate both into the conventional media (press, radio and television) and into domestic, professional or associative activities. Its interactivity enables the user to chose for himself the programmes he wishes to consult, and obtain information directly (games, comments and data of all kinds) compatible with the programme. Telematics is accessible to a far wider public than microcomputing, owing to the simple-to-handle terminal.

The economic implications of the new medium include not only the US$ 7 billion-worth of service sales and subscriptions across North America, Europe and Asia, but also the impact it will have both on household technology and on modes of communication

Gennady Kolmakov's QSL card.

in supermarkets, etc. Between 10% and 30% of mail order shopping is now effected by telematics with the major French companies, while the supermarkets are increasingly experimenting with the use of telematics as a guide to product selection in the consumer's home.

KENYA

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AMEMBASSY Box 55A
APO New York 09675

Active during the recent Boy Scout Jamboree on the Air on October 21 and 22 was 5H0TSA in Dar es Salaam, Tanzania. Tom 5H3TW provided the station equipment and Tom and Rod 5Z4BH monitored station operation. The station consisted of an ICOM IC-730, MFJ antenna tuner and a long-wire strung between two palm trees about 30 feet above the ground. More than 300 contacts were made with 50 countries.

The total number of scouts attending the Tanzanian Jamboree is uncertain, but must have been somewhere between 700 and 1000. Almost all contacts were made by the scouts with just about everyone getting a chance at the mike.

The operation was so successful and generated so much enthusiasm that plans are being made to acquire equipment and obtain a license for a permanent station at the Tanzanian Scouts Association Headquarters.

The Radio Society of Kenya (RSK) has sponsored Jamboree on the Air stations in past years (5Z4LBP) but missed out this year due to lack of advance planning. Upon hearing of the Tanzanian operation, the RSK vowed to be back in action next year to give the boys in Dar es Salaam some competition.

[*Another perfect way to develop the thrill and fun of amateur radio at a young age.*]

LITHUANIA

Jonas Paskauskas LY2ZZ
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Siauliai, 235400
Lithuania

The LYA-LYZ callsign series has been restored to Lithuanian amateur radio stations. This callsign series was granted to Lithuania by the ITU in the 1930s, but was suspended during the occupation in 1940 and replaced by the Soviet Union's UP and RP prefixes.

Banner of the Lietuvos Radijo Megeju Draugija (Lithuanian Amateur Radio Society).

As a result of this government action, the amateur radio stations are completing the changeover from UP and RP to LY prefixes according to the following conversion formulae: UP1 to LY1, UP2 to LY2, UP3 to LY3, UP0 to LY1, RP1 to LY2, RP2 to LY3, and U2 to LY2.

The only exceptions to the above are the five special events club stations (LY2WR, LY2WW, LY2ZA, LY2ZO, and LY2ZZ) which were temporarily issued LY callsigns last year and three amateurs (LY1VV, LY1BX, and LY1BQ) who had callsigns issued them before 1940.

This directive came out too late for incorporation into the 1990 Callbook, but should be incorporated in the 1990 Callbook Supplement.

[*Looks like the actions of Sakalas Uzdavinys UP2BO (now LY2BO) and the delegation from the "Worldwide Lithuanian Amateur Radio Net" were able to receive approval for the callsign prefix change, as reported in this column in the December 1989 issue.*]

MOZAMBIQUE

Phil Gray KA7TWQ
c/o CARE
C.P. 4657
Maputo, Mozambique

While the government of Mozambique has only issued one ham license over the past few years—C9MKT—and refused to renew it, we have hopes they will start issuing licenses again soon. In the meantime, I am very happy to volunteer my reporting skills until I leave, or a Mozambican ham is discovered or comes forward. There are none now.

[*Very happy to have you step forward, Phil, and we are looking forward to more from Mozambique in the near future. Are there any more hams out there in other countries not presently serviced by a Hambassador? I was always told never to volunteer, but in this case I feel it is very important to let the rest of the world know what is happening. Still lots of openings. Volunteer now and avoid the rush.—N1BAC.*]

QRP

Low Power Operation

Michael Bryce WB8VGE
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Massillon OH 44646

Time to Restock the Junk Box

Spring is the time for renewal. Also a time for hamfests. A time to restock the junk box for another long winter of building. This month we'll take a close look at what we need to pick up for the junk box.

Ah yes, the ham's junkbox; the builder's lifeblood. As the old saying goes, one man's junk is another man's gold. So it is with the junkbox.

What do we need to keep on hand for our low-powered construction projects? A second question: Should we go with new, used, or surplus parts?

Surplus parts can really be a godsend. What at one time the government spent thousands for, we can pick up for pennies on the dollar. The only trouble can be finding the same surplus part again. This can be a real pain if one of your buddies wants to make a copy of your circuit. This also can hurt a magazine project. If I can't get the part, I may not want to try to build it.

On the other hand, surplus parts are just great when you're looking for solid state devices. Transistors are usually military specified. That means the part meets or exceeds the specifications needed by the military. I've seen transistors, listed at over $25 each, for only $3. Now that's a bargain!

Goodies

Here is a good list of transistors to keep on hand: plenty of 2N3866s, some 2N3053s, and a handful of 2N4036s, great for switching oscillators and key devices. Of course, your junk box should have some 2N4134s, 4126s, 4401s, 3905s, and 2N3906s. And without question, a box of 2N2222s. If you can, get these in both the metal case and the popular plastic case, the TO-92. I've found that you can get better results with the metal-case 2N2222s, though I really don't know why.

Keep some LM324 op amps on hand, with a dash or two of some old favorites, like 741s, LM339s, and of course, LM386 audio amplifiers. These are used in so many QRP construction projects that no one should be without them. Additionally, no junk box is worth its salt if it doesn't have a dozen 555 timer chips on hand.

Chips and Parts

Since digital electronics is creeping into more QRP circuits, I keep on hand a supply of the most common CMOS 4000 series chips. A dash of the older 7400 TTL chips would not be a bad idea, either.

I keep my IC chips on anti-static mats. Radio Shack sells these for a couple of bucks. The mats fit inside a cigar box with ease. I place the ICs on the foam with the numbers in order. This makes looking up a chip very easy.

Of course, you need a good supply of both capacitors and resistors. As the size of QRP projects get smaller, the junkbox's parts should reflect the trend. Small disc capacitors and electrolytic capacitors are a must. Keep a good supply of silver mica caps. They're great for output filters in transmitters. Keep a supply of the most common values. Don't forget some NPO types for VFO and other frequency-dependent circuits.

By digging for dead radios at flea markets, I can fill the junk box up quickly. You can get a lot of good parts from dead CB radios. You can always use the PA and driver transistor in QRP transmitters.

Who knows? You might even pick up an HW-7 in good condition for next to nothing.

Hot Water Handbook Update

Now for the bad news, in case you do find your dream HW-7. The *Hot Water Handbook* is all sold out. There are no copies left, so don't write and ask for a copy of the second edition.

I still don't have enough new material for the third edition of the handbook. Again, if you have a modification for the HW-7, HW-8, or the HW-9, please send it to me. If I use it, you'll get a free copy of the third edition of the book when it comes out. I don't know when this will be, but look for something late in the year.

Modification for Ten-Tec Knob

While digging through the mailbag this month, I found a letter from Don Garrett WA9TGT which may interest Ten-Tec owners.

His first mod I can relate to. If you have ever owned a Ten-Tec HF rig, you may have had to replace a front panel knob. Seems you really have to screw down the set screws to keep the knob from slipping on the shaft. The problem appears to be the plastic wall that forms the outer ring of the ¼ shaft cavity. This wall sometimes breaks out or cracks, making the knob unable to tighten the set screws down on the shaft. The knob then slips on the shaft, no matter how tight the set screws are.

This failure most commonly occurs on the band switch knob, since it must be well-tightened to prevent slipping while you're turning the band switch. My Triton 4 had this problem. Don's solution is to reinforce the knob shaft cavity wall by filling the space between the plastic wall and the outer knob shell. He uses epoxy glue. Allow the glue to dry for 36 hours, then you can tighten the knob's set screw without breaking the knob. Don tells me this fix completely eliminated the knob failure problem.

Argosy I and II Modification

As the owners of these radios know far too well, the lack of an RF gain control is a pain. Because you can't control the RF gain, you hear an annoying chopping sound in the receiver's background noise. This happens when you're sending CW during higher-than-normal QRN and AF gain levels.

Normally, a reduction in the receiver RF gain setting would compensate for this.

Attempting to add either an RF attenuator or a separate RF gain control is difficult because it's hard to find a dual concentric shaft 10k pot. This modification does not deal with the RF part of the Argosy, but rather with the AGC.

Don's approach to correct the chopping receiver background noise is quite simple. Locate C40 for the Argosy II or C45 for the Argosy I. This capacitor is located on the audio/IF board. Its value originally is 1 mF. Change this capacitor to a 10 mF at 16 volts. It will be necessary to remove the audio/IF board to change this capacitor, about a ten minute job. It is not difficult at all. Installing the 10 mF capacitor in place of the original 1 mF capacitor will result in a slight delay in the recovery time of the receiver, and will eliminate the chopping of the receiver background noise. Don tells me this is the same method used in the Corsair II slow QSK position. Be especially careful to match the proper polarity when installing the new capacitor.

While I've never done this modification, it should work quite well. I've normally turned down the audio on my Argosy II when the QRN or QRM is high. I don't see why you couldn't add a switch, and perhaps a relay, to switch between slow or fast receiver QSK.

I'll have more building projects in the coming months. Be sure to send in the reader service cards—that's one way to generate a steady supply of information for you, the QRP operator. 73

ATV

Ham Television

Bill Brown WB8ELK
12536 TR 77
Findlay OH 45840

ATV Dayton Hamvention Activities

This year's Dayton Hamvention promises plenty of ATV-related activities. When you arrive in the Dayton area, you can monitor the local action on 147.45 or 144.34 MHz. Portable ATV stations from all over the country attend, with some very interesting mobile-to-mobile and even motel room-to-room portable contacts (Earl KS8J generally requests the highest room at his motel). Bring your portable ATV receiver and watch the fun at the hamvention. A trip through the parking lot can net you some enjoyable contacts from RVs and vans. Look for K3ZKO's well-equipped mobile, and for KB2CXM in the Buffalo group's RV.

The local W8BI ATV repeater has good coverage in the hamvention area with input on 439.25 and output on 426.25 MHz. The repeater is vertically polarized, but most of the local simplex activity is horizontal. From the exhibitors' area, you should be able to see several ATV signals from the AEA, PC Electronics, and Wyman Research booths. In the flea market, be on the lookout for the telltale sign of any ham carrying a TV camera with whip antenna attached. You no longer have to describe that great piece of "bargain junk" to your friends on your HT . . . just show it to them on their TV. It won't be long till the "Handie-Lookie" is a reality.

The Friday night ATV Party will be at the Best Western Motel (formerly Travelodge) on 3636 N. Dixie Hwy., hosted by the Western Washington ATV Society and *Amateur TV Quarterly* (ATVQ). Chuck W7SRZ will present the winners of the video tape contest. Several talks and video tape presentations are scheduled, as well as a home-brew contest.

During the hamvention, Tom W6ORG will present the ATV Forum on Saturday afternoon at one of the conference rooms in the O'Hare arena. Several speakers are scheduled to cover getting started on ATV and the latest balloon flight results. Jon WM8W will have his 16-foot ATV kite on display. This kite, shown in the February ATV column, was inadvertently printed upside down. Jon's call is WM8W, *not* M8WM, although many locals have been mistakenly using this inverted call on 2 meters lately.

Saturday evening at the Ramada Inn North there will be an ATV meeting with several speakers, and Spec-Com will sponsor some presentations.

Mobile/Portable ATV

A mobile station can really add a new dimension to ATV operations. Ernie WB6BAP got me interested in this mode during the mid 70s. It was quite a thrill to ride along with Ernie on the Pasadena freeway while sitting comfortably at home in front of my TV set. You can assemble a reasonable mobile station quickly, without using high-gain antennas and expensive hardline coax.

My mobile station consists of a 1 watt transmitter, a 100 watt amplifier, slightly modified B/W TV, video ID, TV camera on the dashboard, and a ¼-wave mag-mount on the roof (I use a 2-element quad in horizontally polarized areas). In the flatlands this setup will usually give me a 20–30 mile range.

It's great fun to roll into a distant ATVer's driveway for that undeniably snow-free picture. This is usually good for an excited "Wow, the band's really up!" from the unsuspecting victim—until he recognizes the front of his house. If you're lucky enough to have mountains nearby, you can cash in on some real DX. A mobile station at 5000 feet should outperform a monster antenna array at sea level. While visiting Santa Barbara, I was able to set up a small beam on a tripod at a scenic overlook at 3000 feet. This netted me a nearly snow-free picture on 1277.25 MHz from the WA6VLF San Diego repeater nearly 200 miles away.

Mobile operations provide a great way to meet the locals during long trips. On a trip from California to Ohio, I made over 80 two-way ATV contacts in eight states.

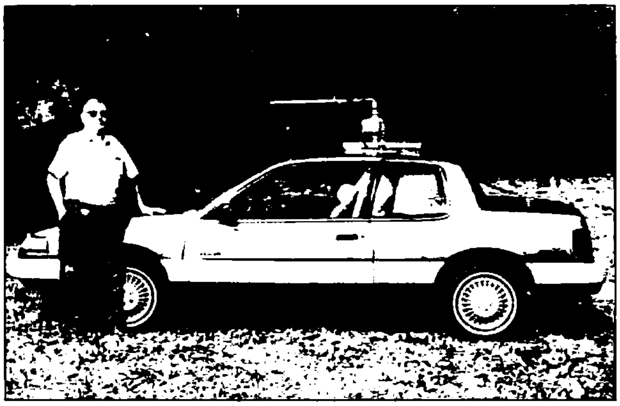


Photo A. Frank Williams WB9KCC and his detachable car-top beam and U-100 ROTOR. Note the use of bungie cords for quick installation.

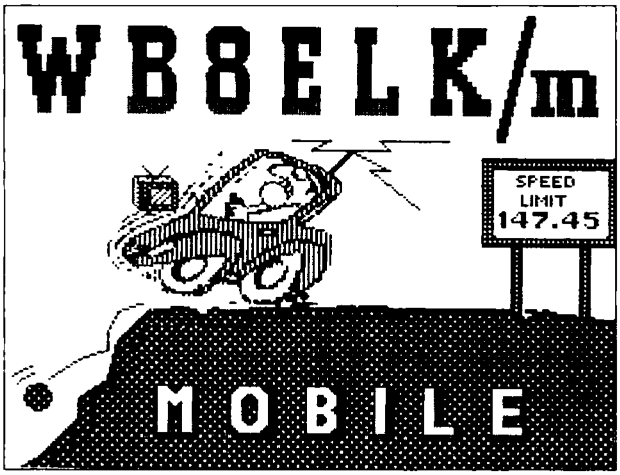


Photo B. When operating mobile TV . . . keep your eyes on the road!

Emergency Services

The ability to put together a quick mobile ATV station can be invaluable in case of disaster or emergency. Several groups are now using ATV to send a visual report to emergency services headquarters from roving mobile stations as well as from helicopters and airplanes. Those chasing severe weather systems could send a live view of the threatening storm to headquarters. Also, the chase vehicles could view weather radar to determine where to investigate. Many ATV repeaters have a live radar feed from the local weather bureau which can be accessed during severe weather.

ATVers can readily cover parades and special events with several well-placed ATV portables. Last May the Indianapolis group provided coverage for the INDY 500 parade from the tops of several skyscrapers. Last year the ATN (Amateur Television Network) of Southern California put on quite a demonstation for the annual Rose Parade. They set up over a dozen portable cameras at strategic intersections which relayed to a portable repeater on a tall building to send the signals to mission control. They even had two motorcycle mobiles as well as a helicopter covering the event. Any medical emergency or breakdown could be viewed quickly by the parade's coordinaters.

Mobile Antennas

As you travel around the country, you'll find predominately vertical or horizontal polarized areas. It's a good idea to have both polarities stacked away just in case. A good ¼-wave vertical should give you reasonable results. However, finding an omnidirectional horizontal antenna poses some problems. Two antennas which work best in this situation are the "Big Wheel" and the "Eggbeater."

The Big Wheel looks like a three-leaf clover with each leaf a ¼-wavelength element. It has a very good omnidirectional pattern and can be easily stacked for more gain. Olde Antenna Lab makes these, and Allied Appli-

ance & Radio sells them (4253 S. Broadway, Englewood CO 80110). They call it the Mini-Wheel, and it's available in kit form or assembled. The Eggbeater, available from AEA, consists of two loops at right angles attached to a powerful magnetic mount.

I've used a 2-element quad with great success during my mobile trips. It gives me a 6 dB advantage over the whip antenna, but I need a large parking lot in order to rotate it! Several enterprising ATVers have used large beam antennas. Ron K3ZKO mounted a beam 6 feet above his van. This works well, but a close encounter with a low hanging tree limb can be a definite problem. Henry KB9FO has solved the polarization problem with a 20-element circular beam mounted on his side-view mirror bracket. This is one tough mirror mount, but it has survived 96,000 miles, and it has been wind-tested to 100 mph.

Frank WB9KCC has found the best compromise. He's actually devised a way of quickly mounting a small beam and a U-100 ROTOR on his car roof. Using a water pipe coupling attached to the end of the beam, he can easily flip the polarity. He even has a Radio Shack Fluxgate compass attached to the beam to give him true beam headings regardless of the car's position. If you try this, just remember to use a beam no longer than half the width of your car, or your antenna may end up attached to a passing 18-wheeler.

"You no longer have to describe that great piece of 'bargain junk' to your friends on your HT . . . just show it to them on their TV."

Portable TV Sets

Many inexpensive portable TV sets will actually receive 70cm ATV signals with little or no modification. These are usually the slide-rule tuning type. ATV operation is generally below UHF channel 14. If they don't quite tune down to the ATV band, usually you can modify them by adjusting an internal limit potentiometer. Check the UHF tuner's tuning voltage. If it stays above 0 volts when tuned below channel 14, a resistor or pot is probably limiting the low-end range. Shorting out this resistor or tweaking the appropriate pot may bring it into range.

When searching for bargain TVs I like to drive up close to the store and turn on my mobile TV transmitter. Then I look for the TV sets that receive the signal. This is usually good for a bewildered look from the salesman when he sees his storefront on the TV. Radio Shack sells two-color CCD pocket TV sets which not only tune the complete 70cm ham TV band without modification, but which are also very sensitive (Pocketvision model 22 or 23).

It's usually a good idea to run coax out from the UHF tuner to a BNC connector to bypass the 300-ohm balun network on TVs with twin-lead UHF connections. On most TVs a good preamp will help. An excellent and inexpensive GaAsFET preamp kit is available from Hamtronics (model LNW-432). A good preamp is also recommended for those of you attempting to view ATV on cable-ready TVs or VCRs (cable channel 58, 59 or 60).

Rules of the Road

One thing to remember when operating mobile TV . . . "Keep your eyes on the ROAD!" Have a friend drive while you operate the TV station from the passenger seat. Some states have laws requiring that a portable TV screen not be visible to the driver.

If you're traveling alone, transmitting from the car is perfectly all right, but try to pull over for the receiving end.

In order to make successful mobile contacts, it's important to find out where each local group hangs out. For your mobile viewing pleasure, drop me an SASE with your travel plans and I'll provide a sort of road service for Amateur TV . . . AAA-ATV? Keep 'em rolling and stay tuned. ■

A Simple Multiband HF Vertical Antenna

Low profile, high performance, inexpensive vertical.

by Allen C. Ward KA5N

Sunspots are back, we have the WARC bands, and multiband vertical antennas are monsters of complexity. All true statements? I thought so until until I stole several different designs (called research) and put them together to get a simple, cheap, and best of all, great working multiband vertical antenna.

Why a vertical? Vertical antennas have a very small footprint, a very important consideration for the city dweller. Vertical antennas also squirt a lot of signal at low radiation angles, and that means good DX! Most multiband vertical antennas use traps and have the advantage of working on several bands with a single coax feed. Unfortunately, all traps have some loss, no matter how well designed. And manufactured multiband trap vertical antennas tend to be expensive as well as complicated.

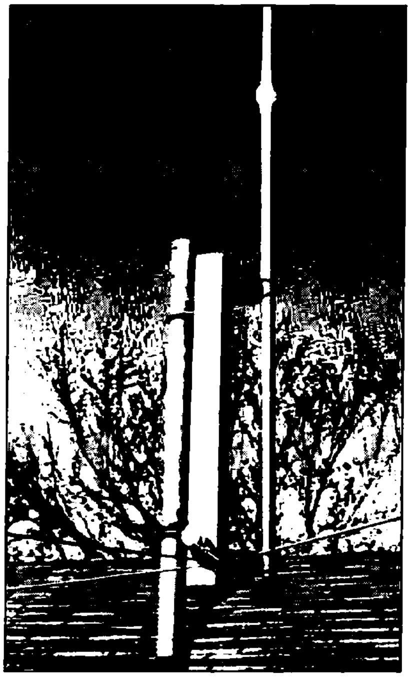
Open Wire, Tuners, and Radials

A vertical should be at least a quarter-wave at the lowest frequency. Without going heavily into theory, the gain of vertical antennas generally increases with length. A half-wave antenna has higher gain than a quarter-wave antenna. Vertical antennas, no matter how complicated, are basically just lengths of aluminum tubing stuck together. Therefore, if we can manage to get RF into it, a quarter-wave of tubing at 10 MHz should provide operation from 10 MHz to 30 MHz, with the gain increasing as the frequency increases.

There are many examples of horizontal, multiband antennas (G5RV, for example) fed with a matching device such as a transmatch or antenna tuner. Most of these designs require balanced open wire feeders for proper operation. Open wire feedlines have to be supported or carefully placed to avoid proximity to conductive objects, and they may perform poorly in rainy or icy conditions.

In the March 1987 *QST* (Hints and Kinks) "A Simple, Multiband Vertical Antenna," by James G. Coote WB6AAM, the author gave a few examples of vertical antennas, successful on several bands, that used open wire and an antenna tuner. In "This Antenna Is Too Good To Be True," by J.W. Spencer W4HDX in the February 1984 issue of *73*, the author described a multiband horizontal antenna which used paralleled coax as tuned feeders. This type of feedline is immune to effects from nearby conductors and can go right into the shack without special precautions. How would this type of feed work with a vertical?

"The paralleled coax feed is the unique part of this antenna."



Connections should be soldered and protected from the weather with tape or silastic compound.

It works great!

The antenna I came up with requires radials and should be elevated above ground (height not critical). The length of the vertical element and the radials should be the same. The radials should be insulated from actual ground or other conductors. The configuration is a groundplane vertical at the quarter-wave frequency. The exact length of the elements is not critical. 16.5 feet gives excellent 20 through 10 meter operation, whereas 21.5 feet gives good results down to 30 meters. Often the radials of groundplane antennas are allowed to droop to raise the feedpoint impedance. Since this antenna uses a tuner, you don't need to do this. However, if you do allow the radials to droop, it should not cause a problem.

Selecting the Tubing

Tubing with 0.047" to 0.055" wall thickness is available in six and eight foot lengths at many hardware stores. Tubing with outside diameters differing by ⅛" telescope together nicely if the larger diameter tube is split with a hacksaw for two or three inches and the smaller tube is telescoped into the larger for four or five inches with the joint secured by a stainless steel hose clamp.

It is a good idea to use some anti-oxidation compound on the tubing. This type of tubing currently sells for $5–$10, depending on the diameter and length. A little scrounging will help in the cost department. I found some ⅝" diameter tubing almost seven feet long, sold as poles to hold up sagging clotheslines, for less than $2 each.

The aluminum poles used to hold up shower curtains, 1" in diameter and 6 feet long, sell for about $3.50 (not the anodized decorative ones, please!). Tubing (usually 12-foot lengths) is also available from wholesale supply houses. The problem is finding a supply house which will sell in small quantities. Your employer may allow you to make purchases through his purchasing department. Discarded CB base antennas and wind-damaged ham antennas are also good sources of

tubing. You may also find aluminum tubing at scrap metal dealers or recycling centers.

Three six-foot lengths of tubing with overlap will do for a 16.5 foot antenna. A 21.5 foot antenna will require one eight-foot length and two six-foot lengths. The diameter of the lowest section should be at least ¾", with each subsequent section ⅛" smaller in diameter.

Constructing the Radials

The radials are made of wire (of course, they could also be made of aluminum tubing). The exact type is not particularly important. I used plastic insulated 20 AWG stranded copper wire because I happen to have a 1000-foot roll of it.

The radials should be connected at the feedpoint, and since they're hot with RF, they should have insulators at the ends farthest from the feedpoint. The radials should be equally spaced, if possible. Four radials are plenty, and you may be able to get away with using only two or three. Just be sure they are all the same length as the vertical element. This is a balanced antenna, so you don't need radials of different lengths for each band.

There are many ways of supporting the vertical element. I chose to use screw-in fence insulators (bought at the hardware store) mounted about a foot apart on a vertical 2 x 4 attached to my patio cover. The tubing is secured to the insulators with galvanized guy wire.

The base of the antenna is 8 feet above ground (quarter-wave at 10 meters). The radials should be at least high enough not to garrote passersby.

Choose the Right Coax

The paralleled coax feed is the unique part of this antenna. The type of coax is important; it should be solid, dielectric coax. DO NOT USE FOAM DIELECTRIC COAX. The voltage rating is not high enough, and it may break down under high SWR conditions. RG-58, RG-59, and RG-8 or their equivalents are all suitable if they can withstand the power level you're using. The feedline is constructed by paralleling two identical lengths of coax. The shields are connected together at each end and grounded at the transmatch, but left unconnected and insulated at the antenna end.

This makes a feedline of either 100 or 150 ohms impedance (depending on the type of coax). One inner conductor is connected to the vertical element and the other is connected to the radials. Most open wire feedline (also called ladderline) is usually 450 or 600 ohms. The impedance difference doesn't cause any problems. One major difference is that open wire feedline is lossless and therefore the SWR on it can be extremely high without any degradation of radiation effectiveness. Paralleled coax will have some loss and should be as short as possible. Loss introduced by a run of thirty feet or so should not be excessive—probably less than that of 3 or 4 traps.

Of course, you can use open wire lead if you insist!

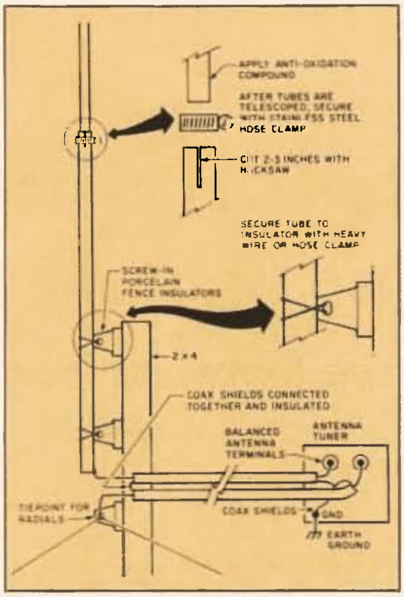


Figure 1. Construction details of the multiband HF vertical. Note placement of the antenna tuner.

Operation with the Antenna Tuner

An antenna tuner (transmatch) MUST be used with this antenna. If you can find an E.F. Johnson Viking Matchbox, either the 275 watt or the 1 kilowatt unit, buy it! Works great with this antenna. These units are conservatively rated and they don't use or require a ferrite balun. Don't be concerned that they do not have bandswitch settings for the WARC bands.

Try tuning on the nearest band settings, both higher and lower than the desired band, and select the settings which give the best match.

Of course, other antenna tuners will also work. Simply select the terminals and settings for balanced feedline. I also recommend the new cross needle SWR meters, as they make tune-up quick and painless.

Having a no-tune transceiver, a multiband antenna, and a matching device, may seem a step backwards. The tuning is fairly broad, so you can make reasonable QSYs without retuning. The benefits are worth the trouble. Solid state rigs will not put out maximum power into a mismatch. The tuner attenuates harmonic radiation and should lessen TVI problems.

You will also note a great improvement in received signal level when the antenna is matched. Too, the tuner is inside the shack so there won't be any trips into the cold or dark to adjust for low SWR.

". . . for a cash outlay (with a bit of scrounging) of about $25 for a multiband antenna, this one can't be beat!"

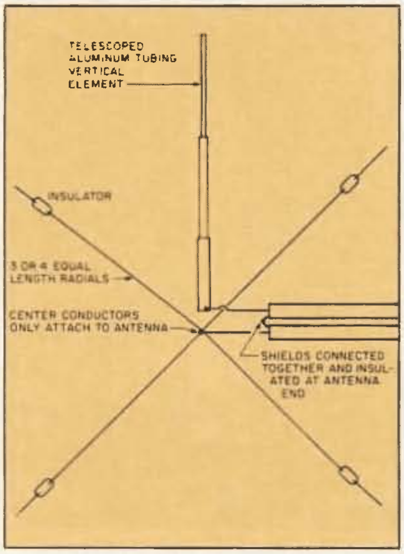


Figure 2. You need only four radials to create a good grounding system.

As Good as the Expensive, Manufactured Verticals

If I had a choice, I would prefer stacked monoband yagis at 125 feet for each band, but for a cash outlay (with a bit of scrounging) of about $25 for a multiband antenna, this one can't be beat! It's easy to tune to a very low SWR on all bands—30, 20, 17, 15, 12, and 10 meters.

You can drape the feedline here and there without unwanted effects, and bring it into the shack through a window.

It is omnidirectional, which can be either good or bad, depending on circumstances. It is my opinion that it works about as well as the most expensive manufactured vertical multiband antenna, and gives the satisfaction of doing-it-yourself and saving money at the same time.

A slim vertical rod has a minimum visual impact. It stands wind very well and rain or ice makes little difference in its performance. Give it a try! 73

Allen C. Ward KA5N, 9703 Ochiltree Drive, Austin TX 78753. A ham since 1954, KA5N has worked in electronics as repairman, technician, engineer, and instructor.

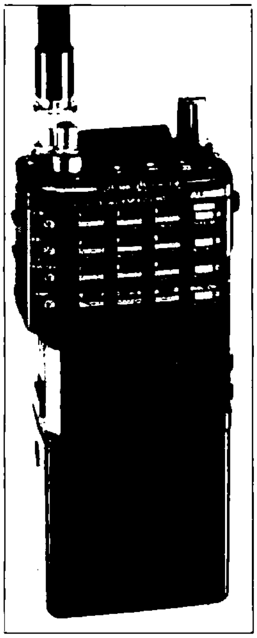
Parts List

Quantity	Item	Price
18–24 feet	aluminum tubing	$0–$25
(depending on scrounging ability and tubing diameter)		
3	fence insulators	$4.50
70–100 feet	coax	$15–$35
100 feet	wire (radials)	$0–$10
3	hose clamps	$3
1	anti-oxidation compound	$1.50
	Total Cost	$0–$80

Number 34 on your Feedback card

NEW PRODUCTS

Compiled by Hope Currier

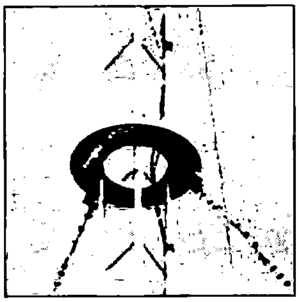


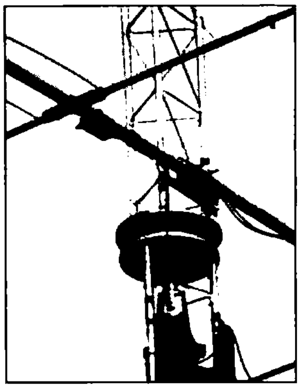
PRODUCT OF THE MONTH

ALINCO ELECTRONICS, INC.

Alinco Electronics is now offering the DJ-160T (VHF) and DJ-460T (UHF) hand-held transceivers. Standard features include simple operation, easy-to-read LCD, three methods of frequency selection, 5W output when operated on 12V DC, and a unique DTMF decode/display feature. There are three scan modes, two selectable scan types, and 20 memory channels plus one call channel. The DSQ (DTMF squelch) function provides three types of paging, compatible with other manufacturers' units. These Alinco handholds also offer many other useful features.

The suggested retail price is $400. For more information contact *Alinco Electronics, Inc., 20705 S. Western Ave., Suite 104, Torrance CA 90501. Tel. (213) 618-8616, FAX: (213) 618-8758.* Or circle Reader Service No. 201.



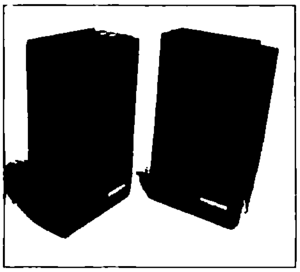


ROTATING TOWER SYSTEMS, INC.

Rotating Power Systems, Inc., is now providing guy wire bearings and rotating base assemblies designed especially for use with the Rohn 25 tower sections and companion rotors. The unique design of this hardware provides exceptional immunity to ice and snow conditions without sacrificing ease of installation or maximum service life.

Rotating stacks of smaller monobanders, stacked tribanders, large VHF/UHF arrays, and antennas mounted at optimum heights are ideal applications for a rotating tower made from these components. In addition, the component design allows the rotating base unit to be mounted at any tower height, minimizing the number of guy wire bearings.

For information and prices contact *Rotating Tower Systems, Inc., Box 44, Prosper TX 75078. (214) 347-2560.* Or circle Reader Service Number 202.



PERIPHEX, INC.

Periphex, Inc. has introduced two new super packs for Kenwood radios, with a 33% higher capacity than the original Kenwood products. The PB-7S offers 7.2 volts, 1400 mAh, 2.5 watt output. The PB-8S offers 12 volts, 800 mAh, 5 watt output.

You can charge the PB-7S with a wall charger or the BC-10 or BC-11 desk charger, while the PB-8S requires either the BC-10 or the BC-11. Both packs are four inches high and will fit into the carrying case designed for the PB-7. All battery packs are manufactured using computer-matched cells. Included are overcharge, over temperature, short circuit protection, and a one-year warranty.

The PB-7S and the PB-8S are priced at $59 each. Contact *Periphex, Inc., 149 Palmer Road, Southbury CT 06488. (800) 634-8132; in CT: (203) 264-3985.* Or circle Reader Service No. 203.

ASHTON ITC

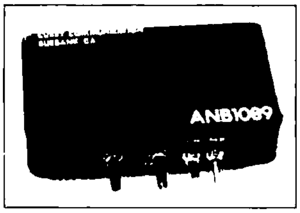
Aries-2™, is a new multi-tasking amateur radio program from Ashton ITC. Like the Aries-1™, it ties together multimode terminal units, computer-capable transceivers, and a real-time logging function. Besides reading data (frequency and mode) from transceivers, Aries-2 adds computer control of these units and supports most rigs manufactured by ICOM, Kenwood, Ten-Tec and Yaesu. This control includes the unique ability to do a timed Log Scan while optionally recording scanned TU input.

Both programs control AEA PK-232 and Kantronics KAM terminal units with simple key presses or mouse clicks. Aries-2 will allow any other smart (command driven, RS-232 capable) terminal unit to be used along with transceiver control.

The electronic logbook in both programs features fast data search capability along with automatic entry of the date and time. With Aries-2, the size of the log files is limited only by available disk space. Both products support a contest mode that offers instant dupe checking; Aries-2 lets the user sort these logs by date, prefix or country.

Both programs include sample message files, a demo-log and printed User's Guide. They are available on 5¼ or 3½ inch disks and run on IBM PC/XT/AT/PS-2s or compatibles with at least 256K memory. For Aries-2, the manufacturer suggests a minimum of 640K memory and a hard disk drive.

Aries-2 is priced at $90; Aries-1 is $65. Shipping and handling charges are extra. For more information contact *Ashton ITC, PO Box 1067, Vestal NY 13851. (607) 748-9028.* Or circle Reader Service No. 205.



CURRY COMMUNICATIONS

Some of the difficulties plaguing the LF/VLF spectrum are noise elimination and suppression of unwanted adjacent signal interference. The ANB-1089 processor is a continuously tunable balanced preamplifier providing 20 dB of gain from 10 to 450 kHz. The preamplifier is switchable to allow the user the choice of a flat response or amplified output for use with a loop or other low gain antenna. The highly selective ceramic filter of the preamplifier allows the user to adjust the lower or upper passband response, alleviating the possibility of overload from strong adjacent signals. This feature also allows the user to shift the IF to improve receiver passband characteristics.

The ANB-1089's automatic noise blanker can effectively remove strong man-made noise and improve static conditions anywhere within the 10–450 kHz preamplifier range. The effective combination of noise blanker, passband filter and preamplifier used in the ANB-1089 can provide a dramatic improvement in the signal-to-noise ratio, and will let your receiver do what it was designed to do—receive!

The ANB-1089 sells for $92. Contact *Curry Communications, 852 North Lima Street, Burbank CA 91505.* Or circle Reader Service No. 204.

Number 35 on your Feedback card

. . . de K6MH

How About It?

When this column started in the December '89 issue, down at the bottom of the page we started another thing called "How About. . ." "How-abouts" are like the *Popular Science* or *Popular Mechanics* sections I used to love when I was a kid, titled "I'd like to see. . ." or some such. One "how-about" we suggested was an instantaneous radio direction finder with parasitic elements that are switched electronically, which will sample and hold a directional reading on a station that is on only a fraction of a second, for instance, a kerchunker. No response yet, such as someone coming up with one that works, a hooray or boo for the idea, or another idea that's one-up on it.

Here's another one, maybe a little closer to home, tho It's not for hams only: How about a wireless remote TV control that has a programmable delay on the MUTE switch, so you can zap your unfavorite commercials and have the sound come on again automatically when they are over? Some years ago one of the audio magazines had a clever circuit that could tell voice from music, and would let music only thru if you so desired. Any ideas? If you wanted to get really fancy, couldn't you digitally record the first few seconds of the obnoxious item and have a circuit to recognize it, with a look-up table for its length, and douse the sound for that length of time?

Another: Unisex Velcro. I've wanted this for putting together geometric models. Could be handy lots of places where you don't want to bother matching A & B types opposite each other.

Surely you readers of *73* have plenty of "how-abouts" you could come up with. So how about it? What should we offer as a reward besides seeing your idea and your name in print?

AH

For years I have been allowing that if I were stranded on a desert island with only one book to choose for company, I would select the book I call the "AH" book. AH is my abbreviation for the American Heritage Dictionary of the American Language. It also signifies the "Ahs" and "Ahas" I get from digging into the treasure-trove of Indo-European roots in the back of this book. For instance, for the word "amateur," the AH book points us to the root word "amma," where we find Latin "amare," to love, and "amicus," friend, with related words such as: amah, amative, amatory, amoretto, amour, enamour, inamorata, Mabel, paramour, aunt, amicable, amigo, amity, enemy, and inimical.

Or take the word "health." The root is "kailo-," meaning "whole, uninjured, of good omen," with related words being: hale, whole, wholesome, Eloise, hail, wassail, heal, holy, hallow, and Olga. Interesting? You should try a few words. You can get hooked on the habit of looking up roots of words. The trouble is, later versions of the American Heritage Dictionary have left out the appendix of Indo-European roots, which have been at least 95% of my fun in using this dictionary. Now its not much different from Webster's or the others. Too bad. If you can find an earlier version in a second-hand bookstore, grab it.

Enjoyment

Some of you may have followed the PBS series, "The Power of Myth," an in-depth interview of Joseph Campbell done by David Moyers. The one piece of advice I remember most vividly from Campbell was "follow your bliss."

This has been coming up when I think of ham radio. I'd say it was bliss, when I was a teenager getting my license, building a transmitter and getting it on the air, hanging around Standard Radio in Dayton, going to hamfests, talking to long-skip stations on 10 meters in the daytime, with local rag-chews around town at night, broken by occasional wild short-skip openings. I'm really curious about ham radio today, who's enjoying it, where and how? When you first got into it, where was the bliss for you? Where is it now? Where do you think it will be tomorrow? Where would you like it to be? What's your fantasy for the ideal state of enjoyability of ham radio? Have you been disappointed? Distracted? Lured away by other interests? Have QSOs lost their zest, become too much alike? Have those occasional real connections on the air become too few and far between? Is it easier just to pick up a phone and touch-tone a friend you want to talk to in complete privacy, with no QRM?

What would you like ham radio to be? I ask because right at this stage, you may be in a better position to bring it about than you realize. Radio amateurs are an asset to society, and they are a force. If we really get it together—coherent, proud, self-regulating, curious, innovative, vigorously self-respecting, our global fellowship could surface as one of the greatest forces for good on this planet. ■

Number 36 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
PO Box 1079
Payson AZ 85541

April should provide some highly unusual DX conditions on the HF bands. Be particularly watchful between the 3rd and the 10th, when strong magnetic field disturbances are likely.

At these times, it is also possible to experience other geophysical and atmospheric activity of an unusually severe nature. On the days surrounding the 27th, there may be some milder disturbances, but otherwise the month should provide some spectacular DX opportunities.

As always, be sure to monitor WWV on 10 MHz or 15 MHz for their propagation trends and announcements of solar activity which, as we all know, relates to earth magnetic field activity—sometimes within a few minutes and sometimes within a day or two, depending on the kind of disturbances observed. Major flares are examples of such solar upsets.

The VHF and UHF bands are also likely to exhibit unusual conditions during these times, so be sure to check them along with the HF bands. ■

EASTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	—	20	—	—	—	20	20	—	—	15	10/15
ARGENTINA	15	15/20	20	40	40	—	—	10	—	—	10/15	10/15
AUSTRALIA	10/15	20	20	20	20	40	20/40	20	—	—	—	10/15
CANAL ZONE	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
ENGLAND	20	40	40/80	40/80	40	—	—	15	10	15	15	20
HAWAII	[illegible]	15	20	20	20/40	20/40	20	20	—	—	—	10/15
INDIA	20	20	—	—	—	—	—	15	—	—	—	—
JAPAN	10	—	20	—	—	—	20	20	—	—	15	[illegible]
MEXICO	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
PHILIPPINES	15	—	20	20	—	—	20	[illegible]	10	—	—	15
PUERTO RICO	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
SOUTH AFRICA	20/40	40	20	20	—	—	—	—	10	10	15	15
U S S R	40	20/40	20	20	—	—	—	[illegible]	[illegible]	—	20	20
WEST COAST	20/40	20/40	20/40	40	40	—	—	[illegible]	[illegible]	[illegible]	[illegible]	20

CENTRAL UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10/15	15	20	20	20	—	20	20	—	—	—	[illegible]
ARGENTINA	15	15	20/40	20/40	20	—	—	10	—	—	10	[illegible]
AUSTRALIA	[illegible]	15	15	—	20	20/40	40	20	—	—	15	10
CANAL ZONE	15/20	15/20	20/40	20/40	20/40	—	—	10/15	10/20	10	10	10
ENGLAND	40	40/80	40	—	—	—	—	—	15*	15*	20	20
HAWAII	15	15	15	20	20	20/40	40	20	—	10	10	10
INDIA	15	15/20	—	—	—	—	—	10/15	15	—	—	—
JAPAN	10/15	15	20	20	20	—	20	20	—	—	—	10/15
MEXICO	15/20	15/20	20/40	20/40	20/40	—	—	10/15	10/20	10	10	10
PHILIPPINES	[illegible]	—	20	20	—	—	—	—	[illegible]	[illegible]	—	—
PUERTO RICO	15/20	15/20	20/40	20/40	20/40	—	—	[illegible]	[illegible]	10	10	10
SOUTH AFRICA	—	—	20	20	—	—	—	—	15	15	[illegible]	20
U S S R	—	—	—	—	—	—	—	15	15	15	20	20

WESTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	[illegible]	[illegible]	15	20	20	20	—	20	20	—	—	15
ARGENTINA	[illegible]	15	15	20	20	—	—	—	—	—	10	10
AUSTRALIA	10	[illegible]	15	15	20	20	20	—	20	—	—	—
CANAL ZONE	10	15	[illegible]	20/40	20/40	—	—	—	10	10	10	10
ENGLAND	20	20	—	—	—	—	—	—	15	15	[illegible]	20
HAWAII	[illegible]	[illegible]	15	15/20	20/40	20/40	40	—	15	10	—	—
INDIA	—	15	20	—	—	—	—	—	15/20	15	—	—
JAPAN	10/15	10/15	15	20	20	20	—	—	20	—	—	15
MEXICO	10	15	15/40	20/40	20/40		—	—	10	10	10	10
PHILIPPINES	10	10	—	—	—	—	—	20	15	15/20	—	—
PUERTO RICO	10	15	15/40	20/40	20/40	-	—	—	10	10	10	10
SOUTH AFRICA	20	20	—	20	—	—	—	—	—	10	15	15
U S S R	20	—	—	—	20	—	—	20	20	20	20	20
EAST COAST	20/40	20/40	20/40	40	40	—	—	10/15	10/15	[illegible]	[illegible]	20

APRIL 1990

SUN	MON	TUE	WED	THU	FRI	SAT
1 G-F	2 F	3 F-P	4 VP*	5 P	6 P	7 P
8 VP*	9 VP*	10 P-F	11 F-G	12 G	13 G	14 G
15 G	16 G	17 G-F	18 G	19 G	20 G-F	21 G-F
22 G-F	23 G-F	24 G	25 G-F	26 F-P	27 P	28 P-F
29 P-F	30 F-G					

*Very Poor

73 AMATEUR RADIO

International Edition

MAY 1990
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PLAN 13
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LETTERS

From the Hamshack

Not Just Signal Reports

Wayne, want you to know that your "Never Say Die" was just superb! You said it all! I've finally got the XYL to take an interest in Ham Radio because it relates to the rest of the world; she heard me check into the "world peace net." "Yes," I told her, "hams do more than give signal reports and have CQ contests."

Floyd Huyber
Wilton WA

Solace from an Old Friend

I've been underestimated by headhunters. I have been misunderstood by employment agencies. I have felt ignored at business card exchanges. I have been forsaken by would-be girlfriends. I have despaired at the prospect of "temping" for the rest of my life. None of the foregoing have seemed to care much that I have a doctorate in communication studies, that I focus my energy on any job I undertake, and that at age 35 I am still curious and open to much going on in this marvelous world. In short, I'm ill with the disease of underemployment, like so many in these days of corporate greed, lying by euphemism, and sheer economic insanity.

As a consequence, I've sought therapy in an old friend—ham radio. When I'm building my Radiokit QRP-20, the old skills emerge in a context that really does matter: The resistor's color code has to be read correctly. The capacitor's polarity has to be observed. The toroid has to be wound and coated carefully. The transistor has to be oriented and soldered properly. The IC has to be handled delicately. The chassis has to be drilled and deburred for correct and meaningful board placement. The motor skills, the background, knowledge, and the attentiveness to detail *not even noticed or queried about* by headhunters, employment agencies, or temp (I hate that word) counselors have, at every step, figured critically in the successful construction of this little kit. No wonder, then, that when I finally turned on the little transceiver, and a soft static rushed vibrantly through the wires to my headphones, I felt joy in the successful accomplishment of a project with concrete results.

The lesson here, perhaps lost on hams who have decent jobs or on hams who use their hobby for public service, rag-chewing, or DXing, is that ham radio can function as therapy—a stabilizing force in a work world filled with idiots, incompetents, and the illiterate.

Mark Rodgers KB8CNT
Trenton NJ

Ham Riffraff

Until recently I had not paid much attention to nor even noticed the inconsiderate operators in our midst.

I was listening to a couple of hams on 10m the other afternoon who were trying to carry on a conversation. Every time one of the gentlemen would try to talk, a third party would break in purposely interfering with their conversation. This "no-mind" would try to jam the conversation by saying "squash squash smash smash." This type of behavior reminds me of the things we used to hear on the CB channels during the heyday of that service.

Every time the issue of the no-code license is brought up, someone voices the opinion that eliminating the code will turn the amateur bands into another CB. Some hams feel that the code is the only way to keep the riffraff out. Ladies and gentlemen, the riffraff are already here. The code test does not keep these people off the air. It is as you say, Mr. Green, up to those of us who enjoy the hobby to see that this type of behavior does not continue. We need to be more involved monitoring the bands and sending "gentle" reminders to those who want to violate the rules. Perhaps a personal visit by 20 or 30 club members would get the point across.

Rich Hanzlik N7NGK

CAP Lt. Speaks

There are times when I feel like a man on a wanted poster. I am 26 years old, college educated, and a field service engineer. I have built receivers and transmitters of my own design. I know about half of the Morse code alphabet. I own four modern digital 2m radios and I build my own antennas. I have SSB voice and data operating privileges near the 80 and 15 meter bands and FM voice and data privileges near the 2 meter band. I am constantly setting up packet radio stations for friends. I am a very active computer, radio, packet, and data telecommunications hobbyist. But I am NOT a ham!

I've always wanted to be a ham. I hold the Amateur Radio Service in very high regard. Several times I have set my sights on the Technician Class license, but each time I lost interest when I began monitoring the ham bands. Your editorial in the December 1989 issue helped me understand why.

I don't care what kind of equipment another operator uses unless I'm considering purchase of similar equipment. I am only slightly interested in the person's QTH. I AM interested in what circuits they have built, what unique solutions they have for common problems, and what kind of life they lead. I guess this would label me a rag-chewer, and therefore no contester would ever want to talk to me (thank God!). Not that contesting is bad, it does develop excellent operating skills. But to do nothing but advertise how much spare cash someone has to spend on a hobby, and wave one's radio-machismo, is not helping amateur radio at all.

I don't lack an elmer, either. I can count eight General Class operators among my good friends. I have helped them design and install antennas, build packet radio stations, and I have fixed their computers. But I am NOT a ham!

As a member of Civil Air Patrol, I have been graciously allowed operating privileges that rival Technician Class. This has provided me with much needed radio experience, and has filled the gap that amateur radio would have filled. And I have become aware of how to kill an otherwise healthy organization. CAP, like the Amateur Radio Service, is a dynamic volunteer service with lots of interesting things for members to get involved with. However, it is beset with an Old Guard with its own ideas. This tends to stifle good times and good public service. The only thing that has saved our Cadet Program is that the Cadets are led by a Cadet Commander who is young.

NOW I WANT TO BECOME A HAM!

Yes, I now have Ham Fever again. Not because I want to find out that it's raining in Cleveland, but because I can make a difference. It does my heart good to know that a ham public figure feels the same way I do. Now I know why I lost my momentum before. Now I know there is something for me to do once my ticket arrives. I can contact W2NSD and have a long chat with the most interesting person in amateur radio I know. As for those boring souls whose whole life begins and ends at the microphone, they can sit by the sidelines and complain about us damn rag-chewers. If they choose to interfere, they will get no more gratification than an invitation to join the discussion. I have a need to know my fellow man, and amateur radio is a great way to do it. I have supported amateur radio all my life. I even read most of the ham publications. Now it's time for me to join the crusade for a new Ham Community.

James Fogg
(Lt. Fogg, CAP, KCC592/
Freedom 644 Mobile)
Bellingham MA

Cleaning up the QRM

Wayne, we have done as you recommended and elected a "Clean Up the Airways" committee. You said you would publish our name in *73 Magazine*. Here it is: Academy Amateur Radio Club, meetings held in Auburn, Washington. The Chairman of Committee is Don Miller WA7FIC, who is also the secretary/treasurer of the club.

Ken McGaughey WX7V
President, AARC
Eatonville WA

DX Embarrassment

The Norwegian DXpedition to Bouvet Island (3Y), one of the rarest of rare DX islands, could have been one of ham radio's shining moments. Needless to say, the worldwide spotlight brought to bear on 14.145 MHz was just too much for some hams to leave alone. In order to allow some operating "elbow room" the first 2 weeks, the Bouvet hams were 5 kHz off the US band and they listened, over an admittedly very wide range, for US operators.

No sooner did one errant ham transmit on the wrong split VFO than dozens of "helpful" policemen let him know—right on Bouvet's frequency. Then each freq-cop had to be insulted by others telling him/her to be quiet! That, combined with intentional COs and assorted garbage, brought innocent cries of "Enough!" and "You're disgusting!" right on the out-of-band frequency. The Mexican and Canadian operators, who had every right to be there, left the frequency in horror.

Fortunately, most of the tens of thousands who called from within the 20–30 kHz of US band space resisted giving comments. But the damage is done . . . on the heels of a Panama invasion, US amateurs now take on the foreign phone band!!

Let's hope sanity returns to DXing, and that other hams will still journey the thousands of life-threatening miles to give us all that rare chance at a rare country.

Hank Goldman WA2ORG
Riverdale NY

Attracting Youngsters

I have a solution! Maybe we can attract youngsters to our hobby by starting something similar to what the merchants in my small city of Whiting, Indiana, do every fall and spring. They have "Frontier Days," during which they move their wares onto the sidewalks and streets in front of their stores for the people to see and buy. It works!

My idea is to move my shack into the front yard as often as weather permits during the kids' summer vacation. We could set aside a national field day where every city in the US would have ham shacks in the front yards communicating up a storm. Show them how and let the kids communicate! Why hide our equipment inside where few people other than visitors can see it? It may not work, but I will damn sure give it a try this summer. Using my existing antenna, it shouldn't take more than five minutes to be in business. I can visualize crowds of inquisitive children around my shack.

Kids aren't lazy. They just haven't had enough exposure to our hobby. Once a year at a shopping mall is not enough. Front yard field days seem much better to me. What do you think?

Bill Haddad WD9HXH
Whiting IN

Need Publicity and Image

I have been meaning to write to you for several years. Your freestyle but pointed editorials never cease to entertain and provoke thought in me. Each of your issues of *73* are read with avid interest, cover to cover.

A nonham reading a story about radio amateur activities today generally doesn't picture himself participating. Why? First, that potential vision is not reinforced. There is very little publicity about the amateur service, even when they perform monumental tasks (the New York Marathon is one example). When some of the stories do leak out of the box, they are couched in misinformation and dull reportage.

In order to entice the new amateur, we need to stress the dramatic aspects of the hobby. The ham who first contacted earthquake victims or the ham who helped save a sailboat at sea. Let's have an astronaut contact some Novices, not the Dayton Cliquefest. Get that story in some newspapers. Send the publicity to the services that communicate with schools.

We need to stress how heroic and stirring it is to use communications and perform useful and critical functions. And we need to stress how good you feel when you participate in the service. These are real feelings from real experiences.

I also have to give you an opinion of the conversations I hear on 2m (I'm still listening). Your readers are absolutely correct, from Holly, New Jersey to Marina del Rey. I really have to search (thank God for scanning capabilities) to find a conversation that's a step above insipid. Keep placing the burrs under their saddles. The hobby needs the stimulation.

Ciro L. Petti
Randolph NJ

MAY 1990
Issue #356

73 AMATEUR RADIO

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FEATURES

ICOM America Service

The ICOM Service Survey by Gordon West WB6NOA, scheduled to appear in this issue, has been moved up to the June issue. Look for it then!

SAREX ground crew. See page 20.

HOME-BREW

REVIEWS

Cover by Alice Scofield.
Cover photo courtesy of NASA.

DEPARTMENTS

FEEDBACK... FEEDBACK!
It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 17. You'll notice a feedback number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*.

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Contract: Reading this binds all you electronikers out there to perform the following: 1) Send for our Writer's Guide. 2) Following the instructions therein, apply at least one of your brainchilds to film, paper, and/or diskette. 3) Send us an article for everyone to benefit. Don't say you can't write—everyone can! You'll even get paid.

Number 2 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1

73's Anniversary!

I remember it just like it was 30 years ago . . . the day I was fired as editor of *CQ* magazine. It was five years, to the day, from the time I was hired to rescue *CQ* from going under.

At the time it was losing, in today's dollars, about $20,000 a month. By 1959 I'd built it up to where it made a profit of $1m that year. After five years I felt I rated a raise. Wrong.

Like anyone else suddenly on unemployment, I had to figure out what I wanted to do next. My love of amateur radio had goaded me into giving up a very good job running a loudspeaker company to help save *CQ*. Promises of great rewards if I succeeded helped too. Alas, there were no great rewards, just firing. Oh, I did get a promise that the $100,000 I'd advanced to help the magazine out of a hole would be repaid. Nothing yet, but heck, it's only been 30 years and I'm patient. That check will come, I'm sure. Hmm, let's see, at 8% interest that'd be about $1,006,250. Yeah, I could use that. An extra million will always come in handy, right?

QSL OF THE MONTH
To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock, NH 03449. Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

I got fired on January 5, 1960, right after Christmas. Hoo, do I remember that Christmas? Cowan, *CQ*'s publisher, celebrated his $1 million net profit from *CQ* that year with a big $5 Christmas bonus for me, making him my hands-down candidate for the Scrooge of the decade.

Since my loudspeaker firm had gone from 100% growth per year to bankruptcy a few months after a new manager took over the company, I decided I'd stay in publishing. I felt there was a serious need for a new ham magazine, one which would emphasize home construction and new technologies.

Indeed, what got me involved with *CQ* in the first place was my fascination with digital communications and RTTY. I have this genetic defect which has caused me incalculable misery all my life. When I see something which someone should do . . . and no one does it . . . I say "heck," and do it. Well, actually, I say something stronger than that, but I don't want to disillusion the many religious nuts who bumble into reading my editorials and who would be terribly offended by what I really say when I give up waiting and start a new, needed, project.

In 1951 I gave up on anyone else starting an RTTY publication and started *Amateur Radio Frontiers*. This quickly escalated to over 2,000 paid subscribers and led to a regular column in *CQ*. I put it out in my "spare" time while I was building the speaker company from a borrowed $1,000 to $2m in annual sales over a four-year period. I edited it, wrote my usual long and controversial editorials, drafted all the schematics myself, took all the equipment pictures with my grandfather's 5x7 plate camera and did my own darkroom work.

Having been booted out at *CQ*, I did some estimates of what it would cost to start a new ham magazine and made the rounds of wealthy hams, looking for some venture capital. No one was interested. So I sold off everything I could . . . my Porsche, Chris Craft, my plane . . . and rounded up just barely enough to put out the first issue of *73*.

The first few years with *73* were mighty tough. I'd just barely got it going when the ARRL pulled that Incentive Licensing insanity on the hobby. That killed off 85% of the ham dealers and 90% of the manufacturers in just a few months. It put most of the ham clubs out of business too.

It wasn't until I became convinced in 1969 that FM and repeaters would save the day for the hobby that things started to turn around . . . for both amateur radio and *73*. Oh, I'd helped pioneer SSB in both *CQ* and *73*, and pushed solid-state in *73*, but it was repeaters which really took off.

Since the other ham magazines were completely ignoring repeaters, my genetic defect kicked in, forcing me to publish hundreds of FM and repeater articles . . . book after book . . . and hold repeater symposiums around the country to help get repeater clubs coordinated. Within two years a new $100m industry was started. It quickly became the most popular ham activity in America . . . and then the world. Today we have cellular radio as the direct result of this ham pioneering.

When the first microcomputer came on the market in 1975 I looked for someone to start a magazine to help this new field grow. When nothing happened my genetic do-good defect did it again, forcing me to be the first publisher of *Byte*. Perhaps I could do for microcomputers what I'd done for repeaters.

It hit again when the compact disc was put on the market in 1983. Someone really should start a magazine to help sort out the good and bad CDs. I gave up waiting and started *CD Review* in 1984 and CDs have become quite an industry . . . about $15 billion this year.

So here I am in 1990, 30 years after starting *73*. I'm still as interested in hamming as I was 30 and 50 years ago. An HT goes with me everywhere. I had one with me out in L.A. and San Diego on my recent trip. Alas, I couldn't find one single repeater that wasn't oft limits to visitors, so I wasn't able to make a contact.???

But most of my time these days is being spent trying to help the independent music companies compete with the six international megacorporations which, together with MTV, control the music business.

My recent editorials on the code have brought in a surprising number of letters from frustrated pre-hams who have jumped on my speed learning system to get their tickets. That got me to thinking, since *Ham Radio* and *QST* aren't on the newsstands and thus are not in a position to help attract newcomers to our hobby . . . and since *73*'s newsstand sell through is quite high . . . what changes might I make in *73* which might increase the general public's interest in amateur radio?

Well, one put-off could be the name of the magazine. As long as we are mainly interested in getting hams as readers, *73* is a great name for the magazine. But if we're going to use the magazine as bait to attract newcomers, perhaps some slight name change would be in order.

Change the name of *73*? Heavens! Good grief, we can't do that! Oh, heck, sure we can. I've always changed the titles of my magazines when I found the market changing. *CD Review* started out as *Digital Audio* . . . back when most of the early CD users were techies. *Microcomputing* was *Kilobaud*, when most computerists were techies.

The new name won't be all that much of a change. We'll de-emphasize the *73* and embolden *Amateur Radio*, adding *Today*. We'll see if that helps get us some interest with today's youngsters. Yes, I wish someone else would do it, but they haven't, so (expletives deleted), I'll do it.

We'll start *(73) Amateur Radio Today* with the October issue . . . celebrating our 31st year of publication.

Though I'm in good health, the recent death of Malcolm Forbes shows just how much a roll of the dice is involved in getting old. I keep busy, mindful of Forbes' dictum. He said he was busier than ever because he had fewer years to accomplish things than before. Me too. So I keep busy, starting new publications . . . each designed to do something which needs to be done . . . getting in skiing, scuba diving, hamming, nuclear submarine piloting, and so on when I can.

As I've mentioned before, I've survived close calls from electrocution, falling off high buildings while erecting antennas, getting killed in wars, car accidents, and even had a very close one with colon cancer. These lucky breaks have gotten me into my late 60s. Now, will heart attacks, strokes, Alzheimer's and the thousands of other disasters which are contributing to the full pages of Silent Keys in *QST* allow me a few more years to achieve my goals? It's a dice throw. My luck has held out surprisingly long, so we'll see.

When I do finally go, I want to thank all of you who have helped me accomplish what tew things I've done to help the world progress a little. I've led an interesting life. A very interesting life.

The response to my desktop publishing editorial was beyond my expectations. I'll bet I got a couple hundred very good responses to that one from hams interested in starting their own publishing businesses.

One more thing. The Music/NH ad on pages 48–50 . . . it's there because I'm a hopeless romantic as far as

Continued on page 70

Number 3 on your Feedback card

QRX . . .

EDITED BY LINDA RENEAU KA1UKM

"Atlas" Radio Michael Harrison Indicted

On August 28, 1989 Michael Harrison was indicted by a Grand Jury in the Eastern District of New York on 50 counts of mail fraud. On February 14, 1990, Harrison was again arrested and incarcerated for violating the terms of bail, including failing to appear in court.

On February 26, 1990 Harrison pled guilty to 5 counts of mail fraud before Judge Jacob Mischler. Each count of mail fraud can carry up to a five-year prison term and a $250,000 fine. Harrison is expected to be sentenced on April 19, 1990 by Judge Mischler. Harrison is currently in jail while waiting for sentencing.

According to the *W5YI Report*, Harrison has a long history of fraud and swindling. Unbelievably, last January he ran an ad under a fictitious name, Robert Pearson, in the *Ham Trader*. Before "Atlas," he operated other scams under such defunct company names as Osborne Computer, Victor Technologies, and Webster Radio, under the names Marc Hansen, Edward Harrison, and John McNamara.

If you would like to write Judge Mischler, please address your correspondence to: Judge Jacob Mischler, US District Court, Long Island Courthouse, Uniondale Avenue and Hempstead Turnpike, Uniondale NY 11553.

Martin T. Biegelman, Postal Inspector of The United States Postal Inspection Service, is grateful to all of you who have provided assistance in the investigation and prosecution of Michael Harrison. If you have any questions, you may contact Inspector Biegelman at (516) 933–2416 or write him at PO Box 160, Hicksville NY 11802-0160.

Communicator Class License

On June 15, 1990, representatives of 18 VEC organizations will meet to determine their position on amateur teaching and testing in regards to the establishment of a codeless license.

In PR Docket No. 90-55, the FCC proposes replacing the Novice and Technician Class licenses with a codeless Communicator Class license. Operating privileges would be all authorized emission types above 220 MHz. All Communicator testing would be conducted under the VEC system.

Privileges for all existing classes would remain unchanged. Current Novices would have credit for 30 of the 60 questions. New Communicator Class licensees not previously Novices would gain full Technician class privileges, including 6 and 2 meters, plus certain HF operation, by passing any code test. Communicator "Plus" licensees would identify with "/AC" when operating below the 220 MHz band.

For information, write VEC Recommendations Committee, PO Box 565101, Dallas TX 75356. VEC chairman of the committee is Fred Maia W5YI. Other VECs organizing the committee are Raymond K. Adams N4BAQ and R.C. Smith W6RZA.

JAS-1b in Orbit

On February 7, JAS-1b, Japan's second amateur satellite, was successfully launched by the H-I vehicle No. 6 from Tanegashima Space Center of NASDA at 0133 UTC. Also on board were MOS-1b, the Marine Observation Satellite, and DEBUT, the Deployable Boom and Umbrella Test payload. MOS-1b was separated first, then DEBUT and JAS-1b were separated one by one, one hour after liftoff. JAS-1b was named "Fuji 2" in Japanese, but it may also be called "Fuji-OSCAR 20" as AMSAT-NA suggests.

JAS-1b is now orbiting with apogee of 1700 km and perigee of 900 km, inclination of 99 degrees and period of 112 minutes. For detailed information with operating schedule and instructions on how to use the Mailbox of JAS-1b, write *The JARL News*, Japan Amateur Radio League, Inc., 14-2, Sugamo 1-chome, Toshima-ku, Tokyo 170, Japan.

Robert W. Gunderson W2JIO Fund

A fund in memory of Robert W. Gunderson W2JIO, who died In 1987, has been started by the Alumni Association for Special Education. Bob W2JIO was the editor and narrator of *The Braille Technical Press*, the only magazine on electronics for the blind and deaf-blind. He taught amateur radio and electronics at the school for many years.

Bob toured the country, speaking to amateur clubs and exhibiting the auditory equipment he designed for the blind. He enjoyed activity in Army MARS. On Saturdays, Bob W2JIO worked at Hudson Radio in Manhattan as an electrical consultant. If you brought him a problem, he'd help you solve it.

Starting in June 1990, each year the Alumni will award a scholarship to a blind or deaf-blind student who is most deserving scholastically. The amount of the scholarship will largely depend on the contributions received. If you wish to contribute, please make your check or money order payable to the Robert Gunderson Memorial Fund Association. Address your letter in care of the Alumni Association Fund, Attn. Joseph Bruno, Treasurer, 420 W. 261 St., Bronx NY 10473.

Soviet Radio Club ACDXA

If you're a ham and a white-water rafter, monitor UA4WAR on 14277 or 14282 kHz at 0315Z weekends, or RA4WZ on 28650 kHz weekends. Soviet radio club ACDXA is looking for US amateurs to join teams for summer competitions. *(DX Bulletin.)*

IPARN Satellite Test

Last January, using only VHF HTs, Canadian amateurs across western Canada communicated over a repeater network in British Columbia connected to a similar network in Alberta. The Inter-Provincial Amateur Radio Network used a narrow band SCPC format on the Anik C2 (Ku-band) geostationary satellite. The 7.5 kHz channel was operated on a PTT basis the entire month. The test included packet via satellite.

IPARN's goal is to build a nationwide VHF satellite-repeater communications network. The test, closely monitored by government and commercial interests, brought very positive comments from both. For more information, write IPARN, Dept. 290, PO Box 3156, Langley BC V3A 4R5.

We wish to thank all our contributors, as listed above. Keep the news coming in!

JAS-1b, Japan's second amateur satellite, was successfully separated from the H-I vehicle No. 6 an hour after liftoff.

SAREX-90

Ham-In-Space Shuttle Missions

by Tom Clark W3IWI, Ron Parise WA4SIR, and Bill Tynan W3XO

Remember the thrill when Owen Garriott W5LFL became the first "ham in space" on the space shuttle *Columbia* in 1983? Owen was followed two years later by Tony England WØORE. Owen's flight had been limited to voice on 2 meter FM. Tony's added two-way SSTV (Slow Scan TV).

How did we manage to get hams in space? Through SAREX, the Shuttle Amateur Radio Experiment. The "experiment" designation opened many doors to future amateur radio participation in US manned space missions. Proposals to include amateur radio on these flights were submitted to NASA by AMSAT-NA and the ARRL. Earlier attempts to have W5LFL operate an amateur station from *Skylab* had failed, so acceptance of these proposals came as a particular pleasure.

Ron Parise WA4SIR, an active AMSAT member, was selected as a Payload Specialist on a mission then scheduled for early 1986. Another ham-in-space opportunity! Ron was especially eager to include packet on his flight. Unfortunately, everything came to a screeching halt with the *Challenger* disaster. Ron's mission, Astro 1, was to be next after *Challenger*.

Plans did not resume until mid-1987. A renewed SAREX Committee gathered. Their task: To promote amateur operation from as many future US manned missions as possible.

Work Begins Anew

At the SAREX Committee's first meeting it was learned that despite the best efforts of the ARRL and AMSAT prior to the *Challenger* accident, SAREX was not included among the planned experiments on the new Astro 1 flight, STS-35. More letters to NASA were needed for approval. And approval by NASA wasn't all: any proposed shuttle experiment had to be thoroughly documented and subjected to numerous rigorous safety analyses and tests.

In the two years since the *Challenger*, various proposals were advanced to again include SSTV and to add an FSTV (Fast Scan TV) uplink experiment, as well as packet, to the SAREX package. In meetings the Committee held with NASA Johnson Space Center officials, it became clear that STS-35 would not have enough mid-deck locker space available for this full compliment of SAREX experiments, mostly because the mission was scheduled to last ten days, requiring more food and supplies than most shuttle flights.

At first it appeared that this would keep amateur radio out of the mission, but a decision was then made to shrink the SAREX payload by delaying the SSTV and FSTV experiments until STS-37 (more on that later), leaving STS-35 with just voice and packet. This shrinking was made possible by the development of a very small TNC, the Tasco HK-21, donated to the project by Heath. The availability of a new, much smaller power supply also contributed. These, along with the same Motorola 2 meter FM HT used before, would make up the entire electronics package. A new side window antenna would round out the amateur equipment.

But wait. . . if we're going to operate packet, don't we need a computer, or at least a terminal? In the years since the packet experiment was first proposed, NASA had equipped the orbiter with a GRID general purpose laptop computer. NASA refers to this as the PGSC, for Payload General Support Computer. One of these will be available for SAREX when it's not otherwise occupied.

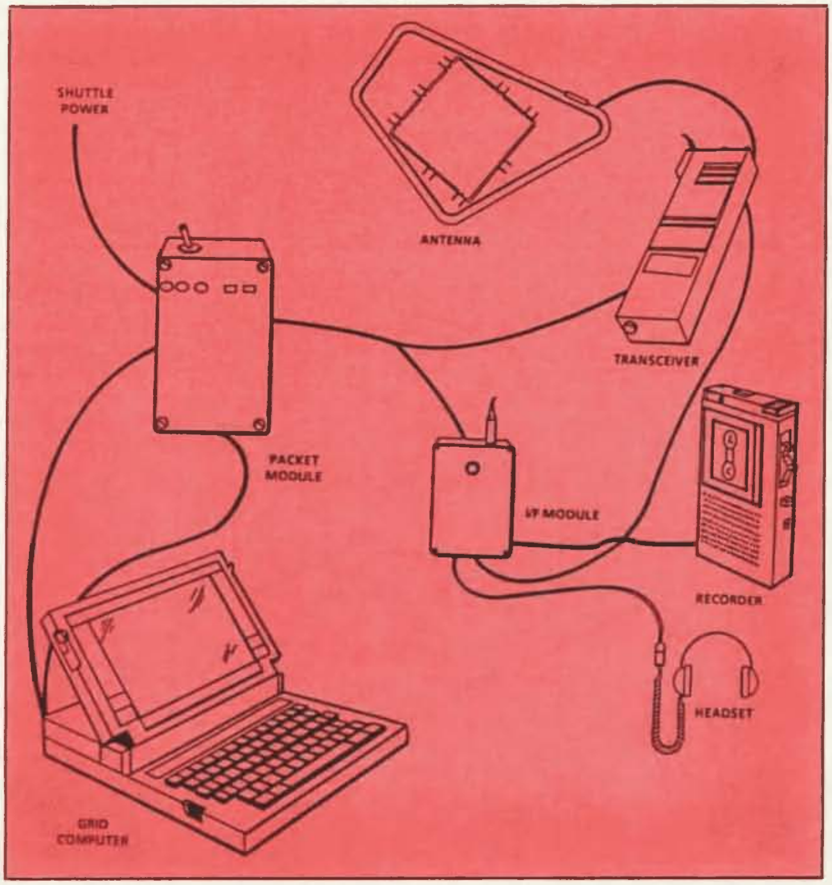


Figure 1. STS-35 Configuration.

STS-35's Orbital Characteristics

A major objective of ham-in-space operations is to expose young people, through amateur radio, to technology in general and to the space program in particular. Doing so, we showcase amateur radio and gain new recruits to the hobby. Unfortunately, the launch is at night, and flight plans for STS-35 present a major problem for our objective: due to the planned 28.5 degree inclination orbit, passes over the US will be less than ideal for classroom participation.

Many factors determine when, where, and by whom a spacecraft will be seen, such as: launch time of day, orbital altitude, and inclination of the orbit. Let's look at each of these, why they were

chosen for STS-35, and how they affect SAREX operation.

STS-35's inclination of 28.5 degrees means that the ground track of the shuttle will never go north of +28.5 or south of −28.5 degrees in latitude. Why would anyone choose an orbit that covered such a limited area? The answer is that a 28.5 degree orbit requires a launch azimuth of 90 degrees, or due east from the Kennedy Space Center. This takes maximum advantage of the earth's rotational velocity to achieve orbital velocity. A higher inclination orbit would benefit amateur radio coverage, but require more energy to attain the necessary velocity, and result in a lower orbital altitude.

The altitude of the orbit determines how much of the earth's surface can be seen from the spacecraft. Astro 1, the primary payload of STS-35, consists of a suite of four astronomical telescopes for observing ultraviolet and x-ray frequencies. An altitude of 350 km (219 miles) was chosen as the optimum height for this payload. For SAREX, this altitude provides line of sight (LOS) paths as far as 47 degrees north latitude and 47 degrees south latitude. All of the continental United States except for the very northernmost points will have line of sight opportunities.

The nighttime launch, required because of mission contraints of the Astro 1 payload, makes it impractical to put on in-school demonstrations by direct communication with the shuttle. Therefore, a relay plan is being pursued.

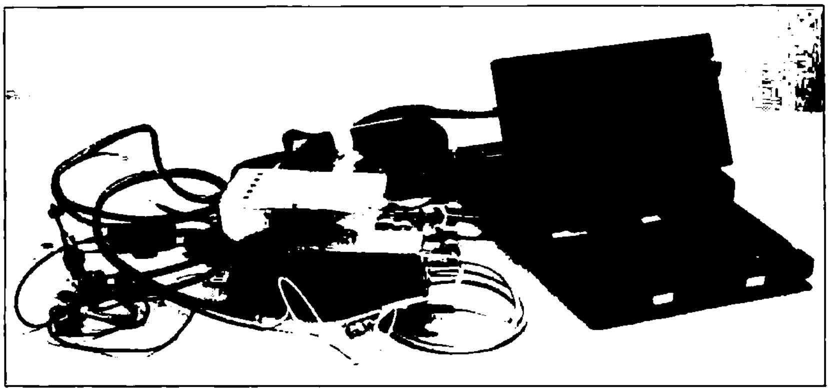


Photo A. STS-35 Packet Station.

Optimum launch time will be 06:00 GMT, or 2 AM EDT, which means that most of the passes over the US will occur during late evening or early morning.

Frequencies

Table 1 lists the frequencies presently intended to be used for FM voice and packet on both STS-35 and STS-37. SSTV on STS-37 is expected to use these same frequencies, while the FSTV uplink experiment on STS-37 will be around 436 MHz.

The primary pair, used on other shuttle missions, are 145.55 MHz as the downlink and 144.95 MHz as the uplink, the customary repeater offset. It fits 2 meter band usage in the rest of the world. The 145.55/144.95 MHz combination is present in both Groups 1 and 4, so that alternate uplink frequencies from Group 1 can be used over North and South America, and those from Group 4 would be used generally in other parts of the world. 145.55 MHz, used regularly by Soviet hams aboard *Mir*, has become the principle frequency for manned amateur space operations.

Note that NONE of the combinations listed are for simplex operation. DO NOT CALL THE SHUTTLE ON THE SAME FREQUENCY ON WHICH YOU HEAR IT. This procedure may be a little strange for packet folks, who are accustomed to working simplex, but everything works the same way as it does when you are operating on a single channel.

A word about frequency deviation for packet operation: Because of the approximately 3 kHz of Doppler implicit in the shuttle's orbit, it is best to keep transmit deviation to about 3 kHz. Otherwise, without Doppler correction, your signal may be so distorted that SAREX cannot copy you.

Linking Up with the Schools

With SAREX classified as a secondary payload, its operating time comes after requirements for the primary payload have been met. Astro 1, a *Spacelab* payload, requires 24-hour operation, so Ron's normal 12-hour duty shift will be completely scheduled with ASTRO activities. The other 12-hour period must, of course, include some time for sleeping, eating, hygiene, change-of-shift briefings, and tending to any mid-deck experiments left, like SAREX.

The scheduling folks allocate eight hours for sleep whether or not one actually sleeps that long, leaving four hours free. These four are divided into two hours after the duty shift, before sleep (imaginatively called PRE-SLEEP), and two hours after getting up, prior to duty shift (you guessed it—POST-SLEEP!). Ron's PRE-SLEEP and POST-SLEEP periods are therefore the SAREX windows.

The good news is that these windows provide excellent coverage for Australia, Japan, South America, and South Africa. The bad news is that the US has poor coverage.

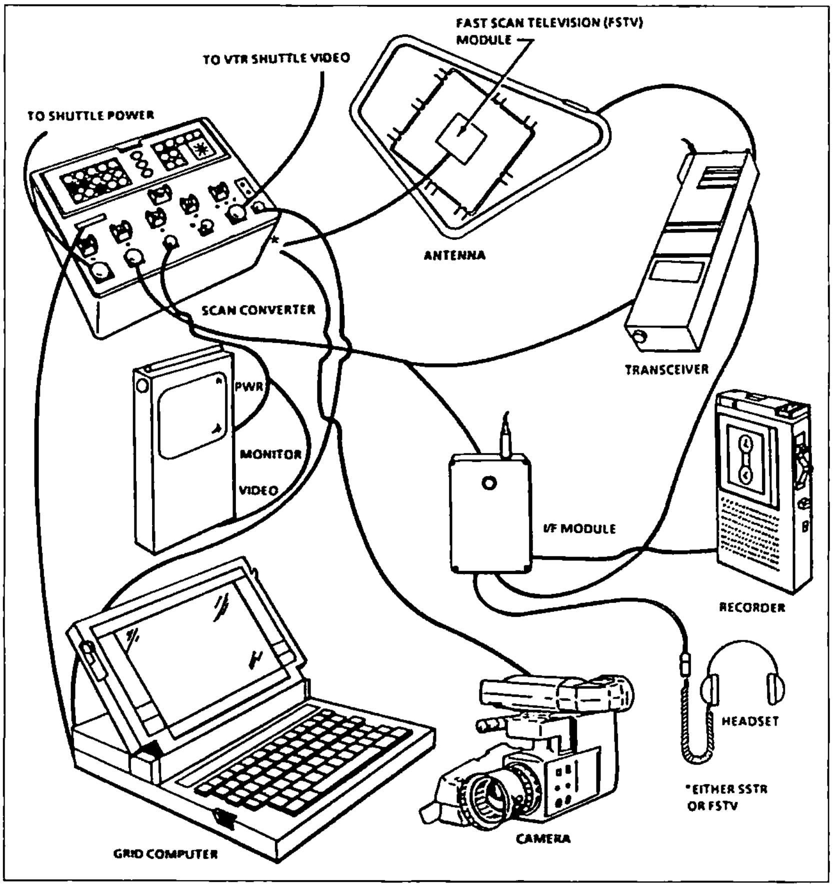


Figure 2. STS-37 Configuration.

But maybe the bad news isn't so bad, since a tremendous effort is being mounted to provide coverage through a network of ground stations in other parts of the world, in conjunction with relay links back to the US. This network is similar to the one created for the AMSAT Launch Information Network Service (ALINS) in support of the recent Microsat/UoSAT launches.

At this end, a telephone bridge will be established to local repeaters. Volunteers across the country will be asked to contact local schools and offer to put on demonstrations of shuttle amateur voice and packet communications using their local repeaters as the final link to the school. A few schools will be selected to participate in actual two-way exchanges between students and the astronauts via amateur radio. For example, if the shuttle is over Australia, a two-way exchange between a US school and the shuttle can be arranged as follows: The school is linked via 2 meters to a local contact who patches them into the telephone bridge. This bridge is then used to hook up with an Australian station who phone patches the conversation up to the shuttle. Repeater groups who would like to hook into the telephone bridge to monitor these activities should contact AMSAT or the ARRL.

This approach involves many more amateurs directly in SAREX operations, and showcases the impressive capability of the international amateur community to set up a worldwide ground network in support of the flight. NASA and industry people who have learned of the amateur community's intentions are truly amazed at the thought of an informal fellowship of communications hobbyists putting together such an ambitious network so quickly!

Packet and ROBOT—Successful QSOs

So far we have been talking about crew-tended operations only, real-time voice and packet QSOs with the crew. Packet ROBOT operations do not require crew attention except for activation and deactivation. The ROBOT will generally be activated during one of the crew-tended windows, then deactivated during the next one. This gives approximately twelve hours ON and twelve hours OFF for the ROBOT, with the operational period chosen to cover all the US passes.

In addition to the planned in-school communication sessions, it is hoped that WA4SIR will have time to make some generally unscheduled direct voice contacts. However, it is the packet radio capability on both missions that will make it possible for far more successful QSOs between amateurs and the shuttle than has been possible on any previous ham-in-space operations. The SAREX packet equipment can be left unattended. The new side window antenna, designed and built by volunteers at the Motorola Amateur Radio Club in Schaumburg, Illinois, can be left in place. The old antenna, which was mounted in one of the upper deck windows, had to be removed when the window was needed for visual observations or photography. The side windows are not normally used during the

Table 1.
SAREX Voice/Packet Frequencies

	Transmit Freqs.	Receive Freqs.
Group 1	145.55 MHz	144.95 MHz
	"	144.91
	"	144.97
Group 2	145.51	144.91
	"	144.93
	"	144.99
Group 3	145.59	144.99
	"	144.95
Group 4	145.55	144.95
	"	144.70
	"	144.75
	"	144.80
	"	144.85

Table 2. QRZ or Heard List

WA4SIR-1>QRZ <UI>:
#3405-NE3H WB6GFJ K5RR KO5I
WB3ILO N3ACL N3FWX WA3TSD W3ZM
WA3USG WB3AXC N3GIY KE4TZ G3ZCZ
KO4A WA3EPT KA3TUU WB3AFL WB3IMM
N3AGG DB2OS DJ4ZC G2BVN 4Z4ZB
G3RWL G3AAJ G3IOR JR1SWB JA1ANG
W3HZU W3INK W3GXT N4QQ W3IWI W3IUI

Table 3.
QSL or Confirming Stations Worked List

WA4SIR-1>QSL <UI>:
NI3F/186 WB2TNL/185 KA3MJM/181
W3IUI/179 WB3AFL/177 NF3N/176
WA3EPT/175 N4QQ/174 WA4SIR/173
W3IWI/172

Table 4. Example of the Metabeacon

WA4SIR-1>QST <I S1 R0>:
Your ROBOT QSO will be automatically logged and you will receive a serial number for the QSO. Your successful QSO will be announced in the beacon addressed to QST. All stations heard by the ROBOT are announced by the beacon addressed to QRZ.

Shuttle Audio HF Relay Frequencies:

WA3NAN—Goddard Space Flight Center: 3.860, 7.185, 14.295, 147.45 MHz

W5RRR—Johnson Space Center: 3.840, 14.280, 146.64 MHz

W6VIO—JPL: 3.840, 21.280 MHz

on-orbit portion of missions.

The HK-21 TNC will be loaded with an upgraded version of SAREX ROBOT software. Successful testing of the updated flight TNC software, written by Howie Goldstein N2WX, was recently completed by W3IWI and others in the Washington area. Joe Kasser G3ZCZ, working with Ron WA4SIR, has configured a custom version of his LAN-LINK packet terminal program to run on the GRID computer.

ROBOT software has two main functions: 1. An automatic QSO machine capable of making a complete, "legal" QSO under computer control. 2. Beacons that tell who has been worked and heard, and which send information on shuttle activities.

Let's take a look at the ROBOT QSO machine. A minimum legal QSO can be defined as the two-way exchange of information with acknowledgment. Here's an example of a QSO between W3IWI and the SAREX ROBOT, WA4SIR-1, as seen on W3IWI's terminal screen. W3IWI types the connect command which is echoed back:

C WA4SIR-1

When a connect is established, these lines appear:

*** CONNECTED to WA4SIR-1
#191—Tnx QSO with the SAREX Shuttle "ROBOT" automatic QSO machine
*** DISCONNECTED

This exchange includes the legal elements of a QSO: The station connects with the ROBOT. In doing so, the station's callsign is transmitted to the ROBOT. By accepting the connection, the ROBOT acknowledges receipt of the information by sending back a unique serial number (#191).

The ROBOT must hear the station's ACK in order to declare the QSO "good" and to enter it into the log. If no ACK is received after a predetermined number of retries, the QSO is not entered into the log. The user knows he had a QSO because he receives a disconnect, and because his call is immediately placed in the QSL log. The ROBOT QSO machine is configured to work up to nine simultaneous connections.

The "Normal" Beacons

The SAREX software on the orbiter's TNC includes two or three beacons sent down at predetermined intervals, probably about every 2 minutes. First, the QRZ beacon lists the last 35 stations heard. An example of such a beacon packet is shown in Table 2. Each time a beacon is sent, a beacon serial number (#3405 in this case) identifies the epoch time to help in confirmation of SWL reports. When the list of 35 fills up, the oldest entry is dropped off the bottom to make way for a new entry. Next, the software sends a list of the last 15 stations worked and the QSO serial number for the contact as shown in Table 3.

The QRZ and QSL beacons may be accompanied by another beacon if desired. In this case the address is SAREX, but it could be anything, as shown below:

WA4SIR-1>SAREX <UI>:
Connect to WA4SIR-1 for a QSO with the SAREX ROBOT.

The Metabeacon

The software also includes a "Metabeacon" consisting of numbered "I" frames addressed to QST which are periodically sent out independent of the QSL/QRZ beacon. The Metabeacon is intended to transmit a longer, up to 1.7K, instructive text message. An example of the Metabeacon is shown in Table 4.

Perhaps it might illustrate how all of this

works by imagining that you are the ham astronaut aboard the shuttle *Columbia* on Mission STS-35. For the W3IWI QSO shown above, here is what would appear on the screen of the GRID laptop.

*** CONNECTED to W3IWI
*** W3IWI QSO confirmed #191
*** DISCONNECTED

The QSL "worked" log is kept in the HK-21 TNC's RAM. Up to 650 entries can be listed, and the list is retained even when the power is shut off. The log lists only unique contacts. If you work the ROBOT more than once, only the first contact is logged, even though you will be given a unique serial number for the later QSOs. The log ignores your SSID, so a contact from K9DOG-1 made after a K9DOG QSO is considered a dupe. The TNC's 650 entry list should last for most of the mission, but it is anticipated that Ron will dump the log once or twice per day to the GRID laptop.

Joe Kasser G3ZCZ has set up LAN-LINK software for the space segment on the GRID PC which will automate most of the functions Ron will need in order to set up the TNC, load the beacons, save the logs, etc. LAN-LINK has a number of features designed especially for ground stations trying to work the SAREX, copy telemetry from the Microsats, and other special activities. (See the Packet Talk column on p. 58 for a description of LAN-LINK.)

QSLs

QSLs—the culmination of a successful and sought after QSO. This aspect of amateur radio has not been forgotten. Cards for stations who have successful QSOs with the Shuttle will be made out automatically based on the QSL "worked" log described above.

SWL cards for people who are heard by the SAREX ROBOT must be handled differently. The TNC simply does not have enough on-board RAM to retain a heard list any longer than 35 entries: the QRZ beacon will send the entire heard list every minute or two, along with the beacon serial number. Anyone wanting an SWL card will have to send a hard-copy listing of the QRZ in which their call appears, complete with the beacon serial number. Or they can send in the whole packet with the header as captured, via packet radio to a collection point to be announced. More detailed procedures will be announced later.

Information Dissemination

Dissemination of shuttle information will be via a system of key stations, namely WA3NAN at the Goddard Spaceflight Center Amateur Radio Club in Greenbelt, Maryland; W5RRR at JSC in Houston; and W6VIO at JPL in Pasadena, California. These stations will operate on HF and VHF 24 hours a day, carrying official NASA supplied voice communication between Mission Control in Houston and the shuttle crew. Amateur volunteers at JSC will feed further information via a computer network to these stations and others, including W1AW.

Updates and operating schedules will also be announced during the weekly AMSAT nets on 3.840 MHz every Tuesday evening (9 PM Eastern, 9 PM Central and 8 PM Pacific time). AMSAT nets are also held each Saturday at 1900Z on 14.282 MHz and at 2300Z on 18.155 MHz. Bulletins will appear on packet BBSs worldwide as well as W1AW transmissions. The Metabeacon may also be used for announcements. Those of you with satellite TVRO systems can watch continuous live coverage of the mission via NASA Select on SATCOM F-2, channel 13. NASA will be highlighting some of the ham-in-space activities via this satellite feed. Also, various ATV groups are planning to retransmit this signal (see the ATV column in this issue). If you'd like to help relay shuttle audio or video into the classroom, please contact Rosalie White at ARRL Headquarters (225 Main St., Newington CT 06111) for a SAREX school information package.

Another Opportunity

Ham-in-space fortunes took another jump when Shuttle Pilot Ken Cameron secured his license and the call KB5AWP. Ken is scheduled to fly on STS-37. Another joint ARRL/AMSAT letter proposing amateur operation on this flight went to NASA Headquarters and was accepted, so plans are underway for yet another SAREX. This time, it appears that there will be room for the entire package, including two-way SSTV (as on the STS-51F mission) as well as voice and packet.

Plans also call for an FSTV uplink experiment. The Amateur Radio Club at Motorola is providing most of the equipment. The new antenna, also made by this group, includes provisions for receiving 70cm ATV signals. Successfully receiving FSTV aboard the shuttle would be a first; although NASA has downlinked hours of FSTV, they have yet to uplink it.

Link calculations are not encouraging, but some dedicated groups across the southern part of the country, where shuttle coverage will be best, plan to expend maximum effort. If they can receive at least a few minutes of acceptable color video, the experiment will be considered a success, and score a first for amateur radio. The SAREX configuration slated for STS-37 is shown in Figure 2.

Current Status

Current plans for STS-35 call for SAREX to carry the Motorola HT used previously, plus a small packet radio TNC (a modified Heath/Tasco HK-21 "pocket packet") and the side window mounted antenna from the Motorola ARC. The TNC will be used with one of the PGSC GRID MD-DOS laptop computers now carried in the orbiter. STS-37 is to include the same functions, plus two-way SSTV capability and the FSTV uplink experiment.

Equipment and software are ready for both STS-35 and STS-37. Flight dates are currently May 9, 1990 for STS-35 and November 1, 1990 for STS-37. These dates represent changes from the previously announced dates of April 26 for STS-35 and June 4 for STS-37. *Excerpted from the AMSAT Journal.*

Bill Tynan W3XO, contact person for this article, may be reached at HCR5 Box 574-336, Kerrville TX 78028.

STS-35 Operating Schedule

All times are in Mission Elapsed Time (MET). MET is calculated from liftoff time. Example: 24 hours after liftoff would be represented as Day 1 0000 MET...Current plans are for liftoff on May 9 at 0447 UTC.

ROBOT Packet

Day 0	2200 MET	—	Day 1	1020 MET
Day 1	2115 MET	—	Day 2	0835 MET
Day 2	2000 MET	—	Day 3	0755 MET
Day 3	1900 MET	—	Day 4	0640 MET
Day 4	1830 MET	—	Day 5	0545 MET
Day 5	1720 MET	—	Day 6	0550 MET
Day 6	1740 MET	—	Day 7	0535 MET
Day 7	1745 MET	—	Day 8	0445 MET

Realtime Voice/Packet Opportunities

(Ron may operate "live" within these time windows)

Day 0	1900	—	2145 MET
Day 1	1020	—	1200 MET
Day 1	2000	—	2115 MET
Day 2	0840	—	1030 MET
Day 2	1830	—	2000 MET
Day 3	0755	—	0930 MET
Day 3	1730	—	1900 MET
Day 4	0640	—	0830 MET
Day 4	1630	—	1815 MET
Day 5	0545	—	0800 MET
*Day 5	1600	—	1730 MET
Day 6	0550	—	0800 MET
*Day 6	1600	—	1730 MET
Day 7	1500	—	1750 MET
Day 8	0445	—	0615 MET

***Special "Astronomy Lesson from Space"...This will be carried on the NASA Select Satellite feed to interactive classrooms at Goddard Space Flight Center in Greenbelt, Maryland, as well as Marshall Space Center in Huntsville, Alabama. This is a great opportunity for hams to relay this session into classrooms via voice and ATV links to involve as many schools as possible!**

73 Review by Jim Eagleson WB6JNN/9

PLAN 13

Tracking Software for OSCAR 13.

Project OSCAR
(for C-64 and IBM)
PO Box 1136
Los Altos CA 94023-1136
Price Class: $30

Molniya orbit satellites, such as OSCAR 10 and OSCAR 13, provide excellent coverage of a wide area of the earth when they reach the highest point in their orbit. Unlike geosynchronous satellites, however, they do not remain at a fixed point in the sky, but are constantly changing in height above the earth (altitude), compass direction (azimuth), and angle above the horizon (elevation).

Pointing Your Antenna

Fortunately, during a large part of each orbit the satellite appears to remain in a relatively stable position, moving only 10–20 degrees in azimuth or elevation per hour. This simplifies tracking considerably. Some people, in fact, have successfully hand-pointed antennas while using both OSCAR 10 and 13.

Of course, it is quite easy to peak up your antenna on Phase III satellites by merely tuning to the beacon and adjusting your rotors until you get the strongest signal. Unlike earlier, low-earth orbit (LEO) satellites, Phase III elliptical orbits give you hours, not minutes, in which to adjust your antennas.

It is even easier to find and use one of these satellites if you already have some idea where it is supposed to be, what time it will be turned on, what mode it will be in, and whether its position is effective for you to communicate with a given station, area, or country.

A number of computer programs have been developed to keep track of OSCAR satellites. AMSAT-NA has a number of such programs for the more commonly used personal computers. Independent authors also offer satellite tracking programs.

Enter PLAN 13

PLAN 13 is a bit different from many of the other programs available. It not only provides the usual azimuth, elevation, distance, mode and time information, but also provides the user with the angle between where the spacecraft's antenna is aimed and the user's location.

The program was developed in Great Britain by Jim Miller G3RUH. It's the direct descendant of PLAN 10, an OSCAR 10 based program offered earlier through AMSAT-UK and Project OSCAR.

PLAN 13 is one of the less expensive programs available because it provides tracking data only. It has no fancy map display, ground track, coverage circles, and so forth. If you want these features, you should consider AMSAT's QUIKTRAK or Instant Track (IBM), or the popular VR-85 tracking program (C-64).

The "Squint" Angle

On the other hand, PLAN 13 provides what G3RUH calls the "squint" angle for the satellite. Keep in mind that in a Molniya orbit, a satellite changes position relative to any given location, and there are many times when the spacecraft's directional antennas are not aimed directly at you. The angle off "dead center" between where the satellite is pointed and where you are located is the "squint" angle. It could be anything from 0 to 360 degrees, but is normally less than 60 degrees during most parts of an orbit.

Knowing the squint angle provides you with a way to estimate just how much so-called "spin modulation" to expect, and whether you need to use more or less power for your uplink. These both depend on how far off dead center you are with respect to the satellite's main beam pattern. This is especially true when using Mode L (1269 MHz) since the beam width on this higher gain uplink is narrower than for other uplinks.

With OSCAR 13, "squint" angles greater than about 20 degrees produce fairly deep nulls in the pattern. While these nulls are not readily apparent when using SSB since many will fall during pauses in speech, they are quite noticeable on the beacon or on stations located on the fringes of the satellite's coverage area. This is why you may hear "local" stations (say, in the continental US) with very little "spin modulation," but Japanese, Australian, or European stations may show considerable nulling. The nulling in this case is occurring on the uplink from the DX station to the satellite since signals from other, relatively local stations are unaffected.

```
SAMPLE PRINTOUTS

IBM

OSCAR 13 - WB6JNN/9        AMSAT DAY: 4036        1989 Jan 19 (thu)

Orbit 3626   AP  197   RAAN  224   ALON/ALAT  180/0   III  97%
 UTC    MA   MODE  RANGE   EL    AZ    SQ     UMD   ECL?   HGT     SLAT   SLON
--------------------------------------------------------------------------------
01 45   224   B    22222   0    333    43    3.51    -    16743     54    140

COMMODORE 64

                OSCAR-13 FOR - WB6JNN

STARTING AT 0000 UTC 19 / 1 / 89

S/CRAFT ATTITUDE USED ON THIS PRINTOUT IS:- LAT= 1  LON= 180

 DAY# 19    ORBIT# 458     ILL: 97%   SOLAR EL:-73 DEGREES

DAY     DATE     HR.MM    AZ    EL    SQ     MA    RANGE    UMD    ECL    MODE

THU 19/01/89  01:45     333    1    46     226   21139    3.37    -       B
```

PLAN 13 printouts for the IBM-XT and the C-64.

Modifying PLAN 13

A BASIC version of PLAN 13 is available for both the C-64 and IBM. You can modify the PLAN to predict what a given path will be like, and you can modify it to suit other needs.

You could, for example, set up a subroutine to compare two or more locations for mutual windows with minimum "spin modulation." Or, you might be more interested in finding access times which are most convenient for you and someone else in a different time zone. This could be important for repeater linking experiments, for example. Identifying periods of minimum "spin modulation" might be your goal for packet, RTTY, or SSTV operations since each of these modes are more sensitive than voice signals to data lost during fades.

You might decide that your personal schedule only allows you to use the satellite for a few minutes sometime between 6–11 PM. You would want to modify the program to report only information about orbits occurring during those hours. You could also add a subroutine to identify Saturdays and Sundays so that you could open up the time window on those two days.

You might only be interested in Mode "B" or Mode "JL" or Mode "S" orbits so that you would set up the program to report only periods during which those modes are active.

PLAN 13 is liberally sprinkled with REM statements so that anyone reasonably skilled in BASIC programming should be able to customize the program. Project OSCAR will be running any program modifications in their Project OSCAR newsletter from time to time.

Information Input and Output

Both the IBM and Commodore versions use separate files to keep station data and Keplerian information. These are called from within the IBM program, but are provided in separate programs for the C-64. The Keplerian data required is the usual information published by A

MSAT-NA on their nets via packet radio and other sources.

In either case, the following station data is required:

Field	Example
1. CALLSIGN	WB6JNN/9
2. LATITUDE	43.10 (Decimal)
3. LONGITUDE	88.34 (Decimal)
4. STATION HEIGHT	333 (Meters)

Documentation for the IBM is included as a file on the disk. You can view it on screen by entering TYPE PLAN13.DOC or print it out with PRINT PLAN13.DOC.

I did not receive documentation for the C-64 version, though I would expect it will be included in the package for purchasers.

Naturally, the IBM version used on an AT Compatible (10 MHz) runs fastest. The uncompiled C-64 BASIC version runs slowest.

I ran a printout in draft quality mode for one day's orbit with the following results:

IBM-AT with EPSON FX-86e printer	25 sec
C-64 with STAR SL-10C printer (BLITZ!)	6 min 00 sec
C-64 with STAR SL-10C printer (BASIC 64)	3 min 00 sec
C-64 screen only (no printer) (BASIC)	6 min 00 sec
C-64 screen only (no printer) (BLITZ!)	2 min 35 sec
64 screen only (no printer) (BASIC 64)	1 min 15 sec

Those using IBM-XT's or PC's will fall somewhere between the C-64 screen-only speeds and the IBM-AT speed. *Blitz!* is the compiler used on the Project OSCAR disk.

> ***"PLAN 13 is liberally sprinkled with REM statements (for easy customizing)."***

Using the ABACUS BASIC-64 compiler, I generated a new program file with the noted results. When printing, much of the speed depends on the buffering capacity and character rate per second. Both the EPSON and STAR printers have at least 2K buffers and 100 cps printing speed in draft mode.

It is impossible to read a full day's output on the IBM screen when the printer is not being used, since it scrolls by too fast. CTRL-S and SCROLL LOCK wouldn't stop the scrolling, and no instructions are provided about how to do this.

You will note that the C-64 printout uses the European/Canadian date form (DD/MM/YY) after giving the Day of the Week rather than the more familiar MM/DD/YY.

The IBM version provides Satellite Latitude (SLAT) and Satellite Longitude (SLON) as well as Height above the earth. The C-64 version, while calculating this information internally, does not print it out (it puts the Day of Week and Date on each line, instead). See the figure.

Furthering the Amateur Satellite Program

PLAN 13 provides a good tracking program with the special feature of providing "squint" angle information. Also, anyone with moderate BASIC programming skills can customize it for special uses. It is one of the least expensive tracking programs available, and all proceeds after expenses go towards furthering the Amateur Satellite Program.

Upgrades to PLAN-13 for PLAN-10 owners are also available for a $5.00 donation. You must, however, send in your ORIGINAL PLAN-10 diskette and a return mailing label.

Project OSCAR has also announced a new program called Mutual Windows. This program provides many of the features suggested earlier in this article as possible customizing options. In addition, Squintplan is available for the IBM PC which combines PLAN-13 and Windows. All programs are $30 each. Send a SASE to Project OSCAR for details. ■

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source— you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

HAM PROFILES

There are no "average" hams!

Photo A. Ronald A. Parise, Ph.D., WA4SIR, Payload Specialist for Astro-1.

Reaching for the Stars

Astronaut Ronald A. Parise WA4SIR enjoys experimenting with hardware. He has been involved in flight, communications, and electronic systems design and development. Currently, he's on the research team for the Ultraviolet Imaging Telescope, and he's pursuing his astronomical interests with the International Ultraviolet Explorer satellite.

When he was 11 years-old, WA4SIR was "bitten" by the ham radio bug. He and a friend went to visit a local ham and he obtained his license the same year.

Dr. Parise is a payload specialist in training to operate experiments aboard Astro, a series of Spacelab astronomy missions. Payload specialists are usually scientists selected for particular Spacelab missions. The UV Telescope will be one of the instruments on board the Astro payload.

Besides astronomy and amateur radio, Dr. Parise enjoys flying, scuba diving, sailing, hiking, and camping.

At home in Silver Spring, Maryland, Dr. Parise is a senior scientist in the Space Observatories Department, Computer Sciences Corporation, where he works with the team on the UV Imaging Telescope.

Is amateur radio valuable in education for young people? "Absolutely." One of the reasons it's valuable, WA4SIR emphasized, is the hands-on nature of the hobby.

Photo C. David Piotrowski KC6HJJ, the youngest ham in Tulare County.

Ham with Many Interests

Ten-year-old David Piotrowski KC6HJJ obtained his Novice license in October 1989. He is the youngest person in Tulare County to obtain his license. By the time this issue of *73* goes to the printer, David will probably have passed his Technician Class exam.

David became interested in amateur radio through his stepfather, Les Delmarter, who has been a ham for more than 20 years.

David is very active on 10 meters, and he likes DXing. He's worked about a dozen countries and 30 states. Every Friday afternoon, he checks in on the young person's net.

A straight-A, 5th grade student at Terra Bella Elementary School, David has a wide range of interests which include computers, literature, music, and sports. He is the youngest member of his school's marching band, and is working toward being a member of the honor band. *(Submitted by Les Delmarter WB6YIK.)*

Fascinated with Electronics

Lt. Col. Kenneth D. Cameron KB5AWP became an astronaut with NASA in June 1985. He's currently assigned as a Capsule Communicator (CAPCOM), and he's in flight training as the pilot on the crew of STS-37. This mission will feature the deployment of the Gamma Ray Observatory for the purpose of exploring gamma ray sources throughout the universe.

Ken KB5AWP has logged over 2,700 hours flying time in 46 different types of aircraft. Flying heads the list of his recreational interests, followed by athletics, hunting, fishing, woodworking, reading and, of course, amateur radio.

Photo B. Lt. Col. Kenneth D. Cameron KB5AWP, Capsule Communicator (CAPCOM), and pilot on the crew of STS-37.

KB5AWP enlisted in the Marines in 1969 and earned his Naval Aviator Wings in 1973, after receiving many special honors and commendations. A Vietnam veteran, he served as a Platoon Commander, and later with the Marine Security Guards at the US Embassy in Saigon. After obtaining his masters in aeronautics and astronautics at the Massachusetts Institute of Technology in 1979, he became a test pilot.

Ken Cameron obtained his amateur radio operator's license in 1986. He's always been fascinated with electrical engineenng and has found that his experiences in amateur radio really helped him learn and enjoy the practical application of electronics. He enjoys kit-building, and the challenge of QRP (low power) operation. A particular thrill was contacting his father, KB1WC in Connecticut, on 40 meters using just 1 watt from Houston. Ken has been instrumental in convincing his fellow astronauts to obtain their ham tickets. Through his efforts, we may see even more hams in space.

Sharing the Adventure with Young People

Amateur radio can make a difference.

by Linda Reneau KA1UKM

Aboard the 36-foot, wind-powered *Agua Alegre*, Mary Duffield WA6KFA teaches young people ecology, sailing, navigation, and ham radio. Mary obtained her license in 1977, when the Lions Club presented her with a rig so that she could communicate internationally while sailing the Pacific for ecological topics to videotape. Since she got her license, amateur radio has taken over her life. It has also been the turning point in many of the children's lives. Now in her early 70s, Mary especially appreciates a good crew of youngsters to share the adventure with her.

Home base is Santa Cruz, California, where she teaches ham radio in the schools.

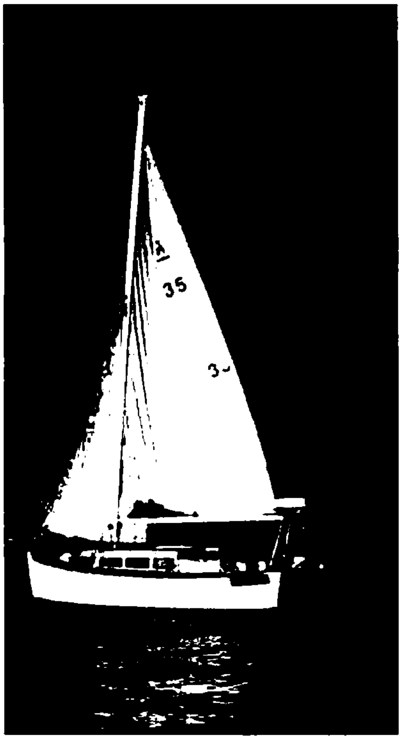


Photo B. Astride the boom of the Agua Alegre, high school senior Todd Meyer talks to his global family. The crew is sailing into another harbor, where they will disembark to visit the local schools. (Photo by Home Power.)

Photo A. Gwen Hadley, Linda Dupree, and Rachel Tomares point proudly to places in the world where they've made friends by ham radio. (Photo by Art Lee.)

Mary has taught hundreds of young people in the elementary and high school grades, and many of them have obtained their licenses. With her young ham crew, she sails from harbor to harbor, to visit schools along the coast. When Mary goes to a new school, she takes one girl and one boy, HTs in hand, and lets them demonstrate amateur radio to the class. Their enthusiasm is quickly communicated to the students. One of Mary's high school girls said, "I feel like we're stitching together the electronic nervous system of the future."

". . . kids actually listening to DOVE sums up what my life has been all about to date!"

A high school dropout, who later became one of Mary's best students, was told by his chemistry teacher that he would never be able to learn anything. Imagine the look on his former teacher's face when the boy showed up one day to demonstrate amateur radio to the class! "That story bears telling and retelling," says Mary.

Doing Real Work

Young people are hungry to "do something real," and Mary's kids have found a way to contribute through amateur radio. Mary encourages young people to take on the challenge of the Planetary Citizen—to begin taking care of the world and each other, to stop polluting and overconsuming the earth, and cease warring among ourselves. Just words? Not for Mary and her students.

One of their projects was to set up an international teleconference on water quality via ham radio and computer networks. Students in junior high and younger, from Scotland, West Germany, New York, Canada, Denmark, Japan, Washington DC, Arizona, and Santa Cruz participated. The Santa Cruz students sent water test kits to all these locations, then shared the results over the air, agreeing to help the school that had the worst water.

The students discovered that the water supply of the Freedom School on the Mohawk Indian reservation in Roosevelt Town, New

Photo C. Helmsman Zary Gusto practices his sailing and ham radio skills aboard the Agua Alegre. He expects to obtain his Novice license soon—by his eighth birthday! (Photo by Zanos.)

York, was contaminated with lead and PCBs. The pollution was so severe that it could be fatal to eat eight tomatoes all at once from the school garden. Since lead accumulates in the body, these children were being poisoned daily, every time they drank from the school water fountain.

Mary's children and others in the network deluged the airwaves, networks, and powers-that-be with their findings, and finally shamed the authorities into trucking clean water to the school. Now, Mary says, they've finally moved the children to a new school.

When kids make something real happen, they're appreciated for their contribution, and they can't help but feel good about themselves. By the time Mary's children finished this project, they were experts in water testing. They acquired this knowledge to save children from being poisoned, not to just get an "A" in chemistry class.

More Projects

During the earthquake last year, Mary and crew assisted with emergency communications. One of the students kept the ambulances in touch with each other. On one mobile expedition organized by high school senior Todd Meyers KB6VOQ, they bicycled to the lighthouses at Point Montara and Pigeon Point on the coast, and set up a ham station to send radiograms to American Youth Hostel guests all over the world. This spring, many newly planted trees will owe their lives to kids urging kids over the net to plant a tree on Earth Day.

Kids working together discover that whether you're ten or seventeen, what counts is what you know and what you can do, not how old you are. They develop a strong sense of camaraderie. Together they listened to high school students in Hamburg, West Germany, describe the threatening cloud cover two days after the Chernobnyl nuclear accident. They listened to the voices of frightened children in the Freedom School. Together, they've made friends with children their age in Mexico City who must already work to survive, and who worry about losing their jobs.

And they heard their messages of peace transmitted on 2 meters from DOVE, which Mary calls AMSAT's gift. "...kids actually listening to DOVE sums up what my life has been all about to date!" Mary had distributed a "Calling All Kids" flyer for DOVE in the libraries and received hundreds of messages. Kids aren't apathetic when they get the chance for action.

"Young people are hungry to 'do something real...'"

Wonderful People

Local hams, such as Ben Deovlet W6FEU from San Jose, California, have volunteered much time, energy, and even equipment. "Hams are wonderful people," Mary says. "They are the technological wing that has kept us flying."

As an example, Mary reports that a call for assistance brought three hams to the aid of Robbi Eschelman, who is building Discovery Museum, centered on telecommunications, in San Jose. In addition to their regular jobs, these hams are putting in many hours of work on the Discovery station. Robbi felt that the museum wouldn't be complete without a ham station. She doesn't have her ham license yet, but she's working on it.

Steve Roberts N4RVE, whose articles have appeared in *73*, is another of Mary's favorite hams. His book, *Computing Across America*, is standard class reading. Mary and her students sometimes read portions over the radio, such as "...now our neighborhood is thousands of miles across. We prowl it endlessly via satellite and bicycle—learning, teaching, sharing, growing...Moscow is only five keystrokes away...Iran, Nicaragua, and South America are clustered together just down the road..." (You can reach Steve at Nomadic Research Labs, PO Box 2390, Santa Cruz CA 95063.)

Mary was delighted when Steve showed up at a couple of her schools. He not only demonstrated his famous Winnebiko; he also showed the kids that it's possible to grow up and do what you really want to do and support yourself in the world doing it. Steve says, "There's a good chance that my future travels will involve a deliberate program of visiting schools and demonstrating this whole technomadic online communicating solar/human-powered lifestyle. It's a message kids need to hear before they assume that their only choices are the ones doled out by guidance counselors."

Amateur Radio in Education

As to ham radio education in the schools, Mary was emphatic. "We have to muscle our way in," she said in her warm, rich voice. When it comes to budgeting, the school board authorities first cut whatever it is that they don't understand. Often, that means amateur radio, and when it's cut from the budget, she volunteers to teach for free. "I'd rather be doing what I want to do, and live on a small pension, than take a job just for the money." The latest good news is that three local school boards have approved the proposal to give 5 credits to any student studying ham radio.

To find elmers for kids, Mary advises that you "get hams and kids together." Take them to club meetings and encourage them to talk about what they're studying, what they're interested in, and what they're having trouble with, and before you know it, one ham or another is helping the youngster. Ham radio turns "couch potatoes into active communicators," Mary says.

Mary, a life-credentialed General Secondary retired teacher, heads the Redwood Youth Foundation, a nonprofit "Peace through Communication" organization established in 1982. This organization sets up ham radio classes in local schools. To find out more, write Mary at 2355 Brommer Street #23, Santa Cruz CA 95062 or call (408) 462-0300.

A Guiding Quote

When Mary is tempted to give up her floating home, the *Agua Alegre* (Spanish for "Happy Water"), she thinks of these lines by Jack Anderson, the columnist: "Each generation, if it is to fulfill itself, must have a dream to inspire it and an adventure to ennoble it." To her, Steve Roberts exemplifies what Anderson meant. Mary's own life is a fine example, too. Says Steve, "Mary is quite a lady. If I still have energy and passion at her age, I'll consider myself very fortunate. She's one of those people who Makes a Difference (and you can quote me)."

An Interview with Carole Perry WB2MGP

Enriching the curriculum with ham radio.

by Mary Alestra KB2IGG

This interview with Carole Perry WB2MGP was conducted and taped at Intermediate School 72 in Staten Island, New York, for *The Ragchewer*. The *Ragchewer* is a newsletter published by Carole's ham radio students.

Mary: How many years have you been a ham radio operator, Mrs. Perry?

Carole: I got my license in 1975 while I was vice-president of an electronics manufacturing firm in New York.

Mary: What got you interested in ham radio?

Carole: Some of the engineers I worked with were hams. I always envied all the fun I would see them having with their radios. One day one of them told me it was too bad I could probably never get a license because, after all, I was a woman. That was enough motivation for me! Since then, I have always been especially sensitive to the intimidation of females to get into this hobby, be it self-imposed or otherwise.

Mary: As a student of yours, I'm thrilled to have gotten involved with your ham radio program. I know a lot of children would like to know how you began the program here at our school.

Carole: In 1980 when the electronics company I worked for relocated, they gave me some time to decide whether or not to move with them. I took the time to return to my first love, which was teaching. There was a temporary opening in the shop department in a local Intermediate School on Staten Island. The principal, Stanley Katzman, offered me the position for three months. I thought perhaps the youngsters would enjoy learning about my ham radio hobby. I convinced the principal to let me try it as a pilot program. Little did I know what I was getting into.

Not only did the students react enthusiastically to it: the parents wrote in, requesting that the course be given again. Each term the program expanded more and more, til I looked up one day, and it was nine years later.

Mary: Why do you think the parents are so supportive?

Carole: I always recommend that the children study at home with a parent. It doesn't take long for a parent to see the value of a program that captures their child's interest and reenforces skills in geography, science, math, social studies and language arts. The parents are always invited to take the license exam with their children. Each term we have moms, dads, and siblings taking the exam, too. It's a great opportunity for parents to study with their children and get into a hobby the whole family can enjoy together. I've received hundreds of testimonials from parents thanking me.

Photo A. Kids participating in the "CQ All Schools Net" on 28.303 MHz at 17:30 UTC, Tuesdays and Thursdays.

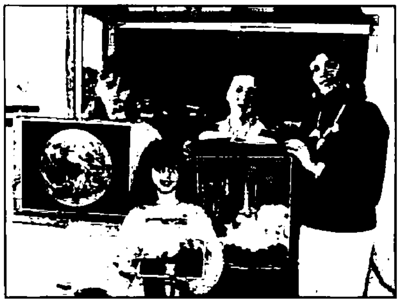


Photo B. Carole's students especially enjoy space projects.

Mary: How many children are in the program?

Carole: I have 11 classes every term with 35–49 students in each class. That means over 800 students a year are being exposed to a whole new world.

Mary: I remember that you told us that taking the FCC license exam is a privilege and has nothing to do with the grade we would get from you.

Carole: That's right, Mary. This curriculum is designed to be exciting and challenging to all students. Children have different backgrounds and abilities, and the license is not necessarily the goal for everyone. The main purpose of my course is to motivate children in all areas of the school's curricula via amateur radio.

Mary: I never realized how much I was learning about geography until I had been a ham for a few months. You were right when you told us how much fun it would be to locate a place on the map while the person was on the air talking to us. One of the most exciting experiences I ever had was when Father Mike EL2BX/9L1 came to visit us from Sierra Leone, Africa. I learned so much about that part of the world. My social studies teacher said he was very impressed with the reports and projects on Africa that the ham radio students did because of our 20m contact.

Carole: That social studies teacher has now done several projects with me. Students can learn more by speaking directly to a citizen of a country than they can from a textbook. Besides, it's more fun.

Mary: You've done so many exciting things because of your involvement with amateur radio. The classes always enjoy listening to you share you experiences. What would you say is the most exciting thing that ever happened to you in ham radio?

Carole: Mary, I've had many memorable experiences in ham radio. I would have to say, though, that our six-month project to prepare for contact with astronaut Tony England WØORE, who was on board the *Challenger* on August 1, 1985, is right at the top of the list. The whole involvement with our student body, the local ham clubs, and the community, breathed new life into our interest in space travel. The culmination was the reception of an SSTV picture from the shuttle onto our auditorium TV monitor. Parents and community are still talking about how exciting it was to be part of what we did.

Mary: You really had all of us jumping up and down in our seats when you described your experiences at Kennedy Space Center last April. We felt we were living a fantasy adventure with you.

Carole: Even though the launch of the Atlantis was cancelled 32 seconds before lift-off, it was a fabulous experience for me just to be there, within four miles of the launch pad. I relive the experience every time I share it with my classes. I tried to convey to the kids how much pride I felt in being an American and being able to witness such a spectacular event. It was because of my work with the children in ham radio that I was invited to attend the launch—once again demonstrating that anything is possible in this dynamic hobby.

Mary: I have to tell you, Mrs. Perry, that one of the reasons many of us got all excited about ham radio at the beginning was because we could feel how excited you were and still are about all the things you do with us. No one in your class thinks that you're here as a

"regular teacher." We all know how much you really love and enjoy getting us involved. Your enthusiasm is contagious. It's great to have a teacher get so excited about her work. When I was home ill last week, I made it a point to check in the "CQ All Schools Net" with you and Joe N6CRX.

Carole: Now you've touched upon a topic that's very special to me. Last year when Gordon West WB6NOA and I began the "CQ All Schools Net" on 28.303 MHz at 17:30 UTC on Tuesdays and Thursdays, we had no idea how well received it would be. It was obvious that the children in my classes were enjoying it tremendously. It soon became apparent that so were many other youngsters all over the country.

The purpose of the net is to stimulate an interest in young people to start communicating on the radio and open up all new experiences to them.

Hundreds of schools and youth groups have checked into the net to let us know how delighted they are with the exchanges we've been organizing. We have children in New York corresponding with school kids in California, Louisiana, Missouri, Nebraska, and many other places. We've exchanged video interviews so the youngsters get to see each other's classrooms and can get an idea of what schools look like in different parts of the country. Many of the children have become pen pals and exchange news clippings. We've spoken to students in a Los Angeles school the day after a recent earthquake. We've had nothing but exciting reports from other teachers, principals, and superintendents about these exchanges.

A big surprise to me was how many students were listening to us on shortwave radios. Many teachers wrote to me to find out how to pursue getting licensed so they could set up a ham shack in their rooms.

As a result of contacts on the net, we've had some fantastic visitors come to our school. There's something really exciting about meeting in person with someone who was just a voice on the radio.

We've had the privilege of playing host to handi-hams and QCWA members from all over the country. We've had hams come to our school with all different kinds of backgrounds to share with my children. Pilots, engineers, TV personalities, missionaries, dentists, scientists, travel agents, train conductors, teachers, and even a bird trainer, came to visit as a result of contacts. You never know who'll be getting back to you and what may come of the contact.

Mary: The ham radio room at our school has come to be a very special place to many students. Years later, former students return to visit a place where they were comfortable and had so much fun. During a recent reunion you organized with a local ham club, several former students came back to share with you how your ham radio program influenced their career choices and studies. You must feel very good about how you're able to influence so many youngsters with the ham radio program.

Carole: Mary, ham radio has had a tremendous influence on my life, and as a teacher, I am delighted to see how wonderfully children react to the exposure to ham radio. It's an incredible motivational tool in a classroom. By the way, Mary, I have never been more proud of any student than I am of you. You are an asset to amateur radio. 73

About Carole Perry WB2MGP

Carole Perry has been teaching "Introduction to Amateur Radio" at Intermediate School 72 in Staten Island, New York, for nine years. She created the curriculum currently being taught to 6th, 7th, and 8th graders.

Carole is the recipient of the prestigious 1987 Dayton Ham of the Year Award, the 1987 ARRL Professional Instructor of the Year Award, and the 1987 CQNEX (QCWA Northeast Chapters) Teacher of the Year Award.

In April 1989, the NASA Education Department selected Carole to attend a special Educator's Conference and a VIP Viewing of the Space Shuttle *Atlantis*.

Carole is also an ARRL Assistant Director in the Hudson Division and Chairperson of the Hudson Division Educational Task Force. Presently, she serves on the National Education Committee of QCWA. In 1988, Carole was selected to be an Educational Advisor to the ARRL Education Department.

Carole has also created Media Mentor, Inc., to help and encourage other teachers to use ham radio to enrich students' knowledge of electronics, science, math, communications, geography, and other cultures. Her *Introduction to Amateur Radio* package includes twenty-six lesson plans, an audio cassette for code practice, a code practice oscillator, free videotape illustrating classroom instruction, and access to Ham Radio Hotline for customer support in using her package. For more information, write Carole Perry WB2MGP, Media Mentors, Inc., PO Box 131646, Staten Island NY 10313-0006 or call (718) 983-1416.

The Biggest Ham Country—Japan

The how and why of the biggest ham boom on the planet.

by David Cowhig WA1LBP

Japan has 970,000 ham radio stations and about 1.5 million ham radio operators—double to triple the figures for the United States! Japan's ham population doubled between 1977 and 1987. The fourth class no-Morse-code requirement operator's license for radiotelephone privileges on all ham frequencies except 10 MHz and 14 MHz and the one-time lifetime operator licenses issued to Japanese ham radio enthusiasts are two big reasons for these phenomenal figures.

The great enthusiasm of the Japanese for electronics and for forming radio clubs that welcome prospective hams contributes enormously to the allure of ham radio in Japan.

Ham Heaven

Visitors to ham heaven in the Akihabara section of Tokyo know that they are on sacred ground. The variety of equipment and parts found there at affordable prices support Japan's legions of electronics enthusiasts. Wonderful ham magazines such as *Ham Journal* and *CQ Ham Radio*, a 500-page ham magazine in a telephone-book format (half advertising, half text) carry articles on home-brewing, DX, ham television, foxhunting (called foxtailing in Japan), the pleasures of communications across borders and language barriers using Morse code, the 9600 bps packet modem for the TNC-2 packet radio controller that does not require radio transceiver modification, live-tree antennas (the ultimate camouflaged antenna), and remote-controlled motor-driven transmatches for mobile operation. Other projects for the experimenter in recent issues of *CQ Ham Radio* include image communications using facsimile, videotex (NAPLPS), using electronic disk still cameras to record images for transmission, and slow-scan TV.

Most of Japan's million or so active hams, along with the rest of the country's 120 million people, live along the coast rather than in the mountainous interior. About 40 million people live within 50 miles of Tokyo. This great concentration of hams makes interference (QRM) a big problem, so the UHF and microwave bands carry a heavier load than in the USA. Beginners prefer the 144–146 MHz and especially the 430–440 MHz frequencies. Tokyo alone has more than 35 repeaters on 1200 MHz. Japan's ham clubs sponsor Field Day activities, transmitter hunts, all kinds of fun get-togethers, and the annual Ham Fair, one of the world's biggest hamfests. These events inspire interest in ham radio. SWLs and other non-hams are welcome to participate in transmitter hunts. Awards for the best homemade ham equipment on that year's home-brew theme are presented every year at the Ham Fair. Combining backpacking in the mountains with operating on 144 MHz and 430 MHz is very popular.

Getting In

In Japan there are two routes into ham radio. The *Amateur Radio Guide* by JA1AYO tells us that prospective hams pass a test at the conclusion of a 47-hour course given by the Japan Amateur Radio League (JARL) to prepare for the fourth class or third class license.

About 60,000 people passed ham licensing examinations during 1988. A ham operator's license is valid for life but the station license must be renewed every five years, so some Japanese hams who use a club station rather than a personal station do not have their own

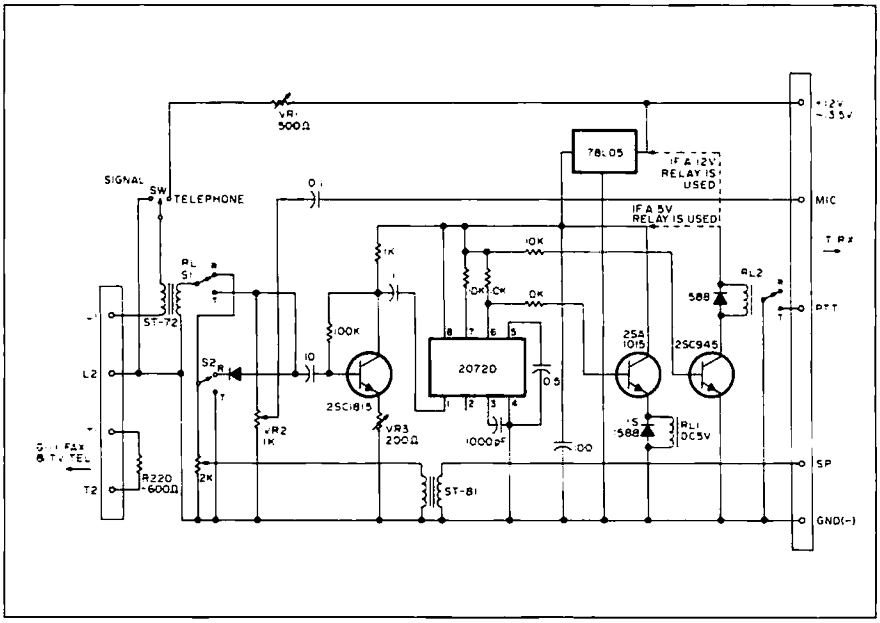


Figure 1. The JA8IJY G3 FAX controller for ham FAX. 1. Adjust 500 ohm variable resistor VR1 so that the voltage at terminals L1 and L2 will be 7 volts when off the hook (when FAX is in the connected state). 2. Value of resistor between T1 and T2: A resistance such that voltage at the start of the transmission will be 4.5–5 volts (when the FAX is connected). 3. VOX-GAIN: Use VR3 to adjust the gain. If transmission doesn't start when the gain is high, change the orientation of 1S1588. If it still doesn't work replace with a diode which has a lower DC resistance. 4. MIC-GAIN: Adjust VR2 to get the appropriate modulation level.

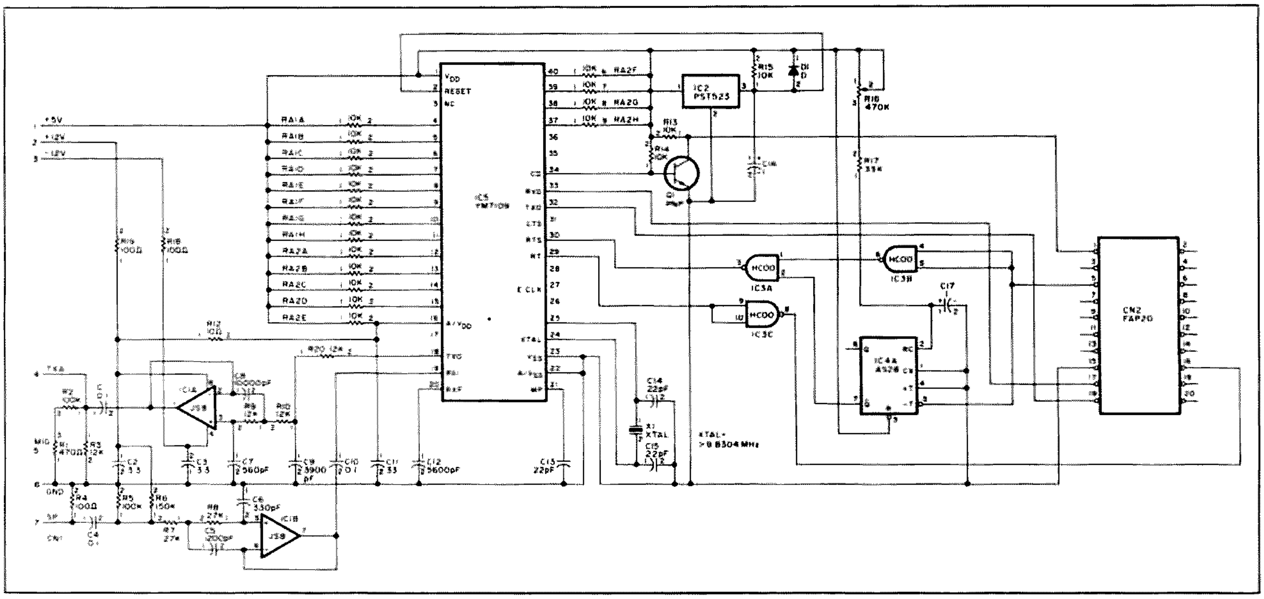


Figure 2. The PRUG V.29 9600 bps modem circuit.

callsigns. Candidates for the second class or first class license must pass a government test. Fourth class operators, about 1.2 million hams, can transmit up to 10 watts output on all frequencies except 10 MHz and 14 MHz and all modes except radiotelegraphy (Morse code). Third class operators, about 100,000 of Japan's hams, have the same frequency privileges but may operate all modes and can transmit up to 25 watts out since they have passed a 5 wpm Morse code test.

Second class operators, 50,000 of Japan's hams, pass a 9 wpm code test and a more difficult examination about electronics and radio theory, to win the privilege to transmit up to 100 watts output on all ham frequencies and modes. The first class operators, 13,000 of Japan's hams, pass a 12 wpm international Morse code test and a 10 word per minute test in Japanese Morse code. The Japanese Morse code is used to send messages using the Japanese syllabary, or "Kana." First class operators can use higher power on all amateur bands and modes.

Japan's 970,000 ham radio stations, which are about equal to the combined listing in the *North American Callbook* and the *DX Callbook*, are listed in the *Amateur Radio Station Callbook*. The two volumes of this callbook published by the JARL are about the size of a metropolitan telephone directory. Relatively few of Japan's fourth class operators move up to the higher classes. Many able Japanese hams find 10 watts on the VHF, UHF and microwave bands adequate and don't have space for big HF antennas, so they have little incentive to upgrade.

The large ham population supports several excellent ham magazines and spurs the development of great new ham equipment. Most of the HF transceivers sold in Japan are of the 10 watt variety. We see only the 100 watt versions over here.

Join in the Fun

We can learn from some of the interesting new modes and home-brew projects developed by Japanese hams. Exchanging videotex images by packet, a 9600 bps modem for the TNC-2 packet controller, 9600 bps facsimile by radio, and tree antennas are some of the exciting ham projects discussed in *CQ Ham Radio* during 1989.

Akihisa Kurashima (Roy) JM1VSP and several other Japanese hams and members of ASCII-NET have created MS-DOS North American Presentation Layer Protocol Syntax (NAPLPS, pronounced NAP-LIPS) videotex software for ham radio and BBS use. This software creates, puts in a convenient file transfer format, and displays either in real-time or from a saved file NAPLPS color videotex images on IBM compatible personal computers. A mouse-driven NAPLPS editor works on Japanese PCs but not on IBM PCs as yet, so creating videotex images takes some time. The work is worth the effort to learn about an interesting method for sending pictures, maps or other graphic data by our digital modes such as packet and RTTY.

Maybe one of you will write an MS-DOS version of the NAPLPS mouse-driven graphics editor so videotex packet can take off on this side of the Pacific. You can download NAPLPS software—NALPVIEW.ZIP, etc.—and sample videotex images from Japan from the *73* BBS at (603) 525-4438 or from the Virginia Connection, a 19,200 bps landline BBS at (703) 648-1841.

JA8IJY has developed a very simple, inexpensive method to put a telephone facsimile machine to work with your ham transceiver. The latest Group 3 facsimile machine calls use high speed digital transmissions at 9600 bits per second with fallbacks to 4800 bps and

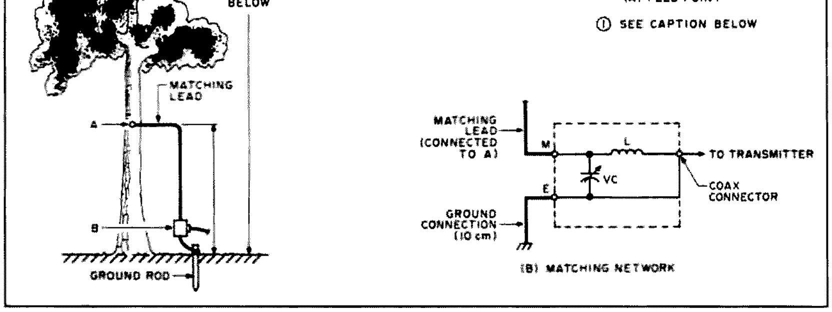


Figure 3. A tree antenna. 1. C: 70 pF 500 V variable capacitor, adjusted about halfway in; L: 0.9 μH coil. 2. Tree used is about 3.73 meters high, diameter at A is 12.5 cm; at B 16.6 cm.

2400 bps if line conditions are poor. Normal G3 resolution is 203 lines per inch horizontal and 98 lines per inch vertical. G3 facsimile machines have become very popular in homes and offices over the past year. A basic G3 telephone FAX costs about $500. G3 ham facsimile may become popular as the price of these machines drops further and used facsimile machines become available.

Mr. Fukunishi JA8IJY suggests using G3 facsimile with an HF SSB transceiver but using FM or SSB to transmit on VHF and UHF. JA8IJY's G3 FAX communication system does not require any modifications to an ordinary G3 facsimile machine. See Figure 1.

Higher On SSB Than On FM

JS1DCF and JL3OUW of the Packet Radio Users' Group (PRUG) in Japan described in *CQ Ham Radio* the PRUG 9600 bps modem for the TNC-2 packet controller that can be used with SSB and FM rigs without modification to the rig. Transmitting at 9600 bps transfers messages much faster than at 1200 bps, especially for long frames, but phase lags caused by fading or multiple path reception affect 9600 bps transmission much more severely. May 1989 experiments on 430 MHz SSB by JN1OLJ and JR2BNF show that 9600 bps packet on SSB is possible using some unmodified SSB transceivers such as the IC-735.

"Ham radio is a great tool for learning about foreign languages and cultures."

In the November 1989 issue of *CQ Ham Radio* JL3OLW describes this 9600 bps modem and modifications to the MFJ-1278 TNC to accommodate it. The Yamaha YM7109 9600 bps FAX modem chip used by this modem, like the 9600 bps FAX and landline modems used widely today, operates at 2400 bps and uses the quadrature modulation technique to quadruple throughput to 9600 bps using the CITT V.29 standard. Using V.29, bit strings of four bits (which have 4 x 4 = 16 possible combinations) are sent as a unit by modulating a 1700 Hz subcarrier to produce eight different phase shifts and then using high and low amplitude signals to produce 16 different states (8 x 2 = 16). The modulation speed is one-fourth of 9600 bps, or 2400 bps. The subcarrier has sidebands which are one-half the modulation speed 1700±(2400/2). These sidebands in the 500–2900 Hz range fall within the 300 Hz–3 kHz range used in amateur voice communications that have an audio range of 300–3 kHz. With the release of this modem/TNC design and the availability of the G3RUH modem in Japan, 9600 bps packet stations are becoming much more common there. See Figure 2 for a circuit diagram of the PRUG 9600 bps modem.

Tree Antennas

The best concealed antennas are something else. JA6HW and JA6AUI described their experiments with live tree antennas in the May 1989 issue of *CQ Ham Radio*. Live tree antenna designs were discussed in *QST* and *Radio* during the 1930s and used by U.S. forces in Vietnam. JA6HW and JA6AUI describe a matching unit and the matching leads they used to load a 12 foot high tree on the 10 meter band. They worked stations in the US, Europe, Australia and Asia on 10 meter CW, SSB and FM with 50 watts to the tree. The SWR using the matching network was better than 1.3:1 across the entire 10 meter band. Measurements with an electrical field-strength meter showed that the tree, not the matching lead, was the radiator. Most of the radiation was vertically-polarized but horizontally-polarized radiation was stronger near horizontally-oriented leaves. They believe loading a tree using a toroidal coil around the tree trunk may be possible.

It's fun to experiment. See the details of their L network loading arrangement in Figure 3. Measure the DC resistance, impedance and resonant frequency between points M and E (across the matching network between the matching lead and ground). Using an impedance meter, they found a capacitive impedance of 400 ohms on their tree at 27.5 MHz, so they plugged into the standard formulas to match 400 ohms to the 50 ohm impedance of their coaxial cable. They could then find the proper values of the network capacitor and the inductor. You will have different values for the matching network and length of the matching lead according to the size of your tree antenna.

How's Your Japanese?

Did you ever feel embarrassed about all those foreign hams talking to you in English while you weren't able to carry out even a brief name, QTH, or signal report contact in a foreign language?

Japanese for Hams, a ten-page, very elementary introduction to Japanese conversation for English-speaking ham operators gives you the phrases you need to make basic contacts with Japanese hams. It gives you about the same amount of Japanese that many foreign operators have of English. Japanese pronunciation is very easy—its the Chinese characters of written Japanese which make people think speaking Japanese is hard. The next time you need a topic for conversation when you are working a JA, drag out *Japanese for Hams* and ask for help with your pronunciation or for additional phrases. You might make a new friend. At the very least you can give a JA operator a good laugh!! Thousands of potential Japanese language sensei (teachers) await you on the ham bands. You can download *Japanese for Hams* (JAHAM.ZIP) from the *73* BBS or the Virginia Connection BBS listed above.

Ham radio is a great tool for learning about foreign languages and cultures. As a nearly monolingual continental country, we in the USA need to better appreciate the great work being done overseas. Let's use ham radio to build friendships with hams in Japan and other countries. ■

A Low-Cost Wideband Preamplifier

Using a versatile little Motorola IC.

by Bill Unger VE3EFC

Recently I was trying to do some low level RF measurements. I needed a preamplifier with a minimum of 20 dB gain and a bandwidth of several hundred MHz. I started to use discrete transistors and broadbanding techniques to build an amplifier but I quickly ran out of board space. Transistors, resistors, capacitors and toroids take up a lot of space. And I still didn't get the bandwidth that I'd hoped for!

The solution I found was a family of ICs by Motorola called "Wideband Amplifiers" (part numbers MWA110, MWA120 and MWA130). Their specifications are amazing considering they are three-pin devices in TO-39 cases. They have 14 dB of gain from 0.1 to 400 MHz and the input and output impedance is 50 ohms. The output power capabilities of the MWA110, 120 and 130 are −2.5, +8.2 and +18 dBm respectively. There are only three external parts required to make them operate.

Figure 1 is a schematic showing two of the amps cascaded. The coupling and bypass capacitors must have a low reactance at the operating frequency. I used 0.1 uF disk capacitors, however chip caps are recommended.

The value of the bias resistor is calculated using the formula:

$Rb = Vcc - Vd / Id$
Vcc = supply voltage
Vd = device operating voltage
Id = device operating current

Table 1 gives the values for Vd and Id. You can calculate the value of the bias resistor or you can use the values I have supplied. I suggest that you use a Vcc of 12 volts or greater. With lower voltages the bias resistor is small compared to the 50 ohm output impedance and the signal will want to get into the power supply instead of the next stage. Do not forget the bypass caps or the circuit will start to oscillate.

Figure 2 shows the circuit board layout and parts placement diagram. I scribed the outline on a piece of surplus double-sided PC board measuring 1 x 2-9/16 inches and then etched it out using a Dremel tool. The board is soldered directly to the RF connectors and mounted in a Hammond 1411C chassis to reduce lead length. The resulting board works well and takes just a few minutes to make. (The bottom side of the board is used as a ground plane.)

You can use this versatile little IC in many projects where an RF amplifier is called for. I have used it as a preamp for a direct conversion receiver and a frequency counter. It doesn't take up very much room so it's easy to install in existing equipment.

The Motorola MWA series is "second sourced" by many of the large semiconductor suppliers. If you have trouble finding it, browsing through the transistor repair manual at the local TV repair shop will probably get you a lead on the device.

Bill Unger VE3EFC has been licensed since 1970. He spends most of his time "melting solder" and building QRP rigs. He works as a network supervisor for TV Ontario. Contact him at 1272 Birchgrove Dr., Thunder Bay Ontario P7B 5E2 Canada.

Table 1.

	Vcc	Vd	Id	Rb
MWA110	5 VDC	2.9 VDC	10 mA	210Ω
	6			310Ω
	12			910Ω
MWA120	5	5.0	25	1Ω
	6			40Ω
	12			280Ω
MWA130	5	3.2	25	85Ω
	6			120Ω
	12			360Ω

Table 2. Wideband Preamplifier Cost Breakdown

Resistors	2 x 0.10	$0.20
Capacitors	5 x 0.50	$2.50
MWA110	6.00	$6.00
MWA120	7.00	$7.00
Chassis	4.00	$4.00
RF Connectors	2 x 3.00	$6.00
PC Board	2.00	$2.00
	Total	$27.70

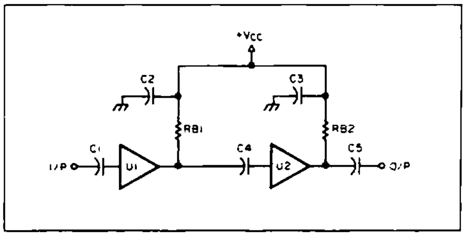


Figure 1. Vcc = 12 Vdc; C1 to C5 = 0.1 µF; RB1 = 910Ω; RB2 = 280Ω; U1 = MWA110; U2 = MWA120.

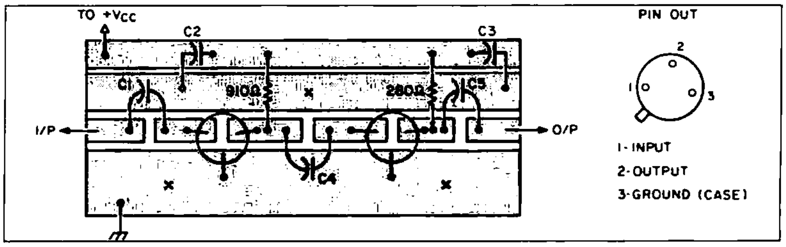


Figure 2. PC board layout (shading represents copper) and parts layout. "X" is the feedthrough wire to the ground plane. All capacitors are 0.1 µF. Keep all leads short.

73 Review *by Bill Clarke WA4BLC*

The Cushcraft D3W

Rotatable dipole for the WARC bands.

Cushcraft Corporation
48 Perimeter Road
Box 4680
Manchester NH 03108
Tel. (603) 627-7877
Price Class: $200.

Recognizing the lack of antennas specifically designed for the WARC bands (30, 17, and 12 meters), Cushcraft has introduced a high quality, trapped tubular aluminum dipole.

The new antenna, the D3W (dipole 3-band WARC), physically resembles the driven element of a tribander. Although not providing the directional patterns of the latter, the D3W is an easy and rugged answer to the WARC band antenna problem.

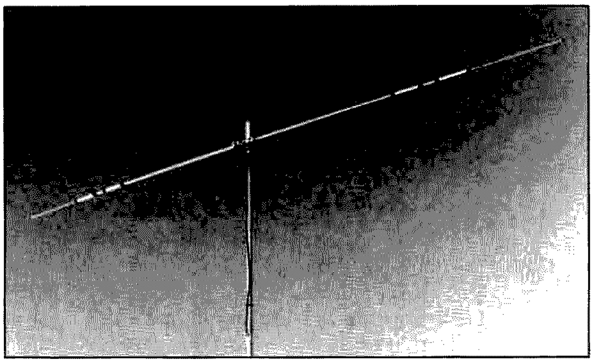


Photo A. The Cushcraft D3W Rotatable Dipole (photo courtesy of Cushcraft).

Assembly and Mounting

The antenna arrived in a box containing numerous tubular parts, traps, and assorted hardware in the exact quantity required for assembly.

Assembly was quick and easy, taking about two and a half hours. Careful element measurement is a must to ensure that the antenna will perform according to specifications.

The dipole offers little wind resistance. It weighs only 11 pounds, hence I put it on an old TV antenna rotator for directional control. This was mounted on a heavy duty push-up mast attached to the side of my house. I was correct in assuming that the D3W's size and weight would allow it to be mounted inexpensively. But one word of caution: When using a push-up mast, you must have structural support (such as the side of a building), or use proper guying techniques. Failure to heed this advice will result in possible injury and damaged equipment.

Performance on the Bands

The new antenna loaded well with good SWR readings on any of the WARC bands. Of course, you must remember that these bands are rather narrow and I expected no problems in the bandwidth area.

Contacts were easy on each band, and the limited amount of directivity afforded by rotation was as expected. In other words, it was about 3 or 4 S-units down on the side (per my S-meter), compared to reception from front/back. This is a definite edge over a fixed wire dipole and it improves with antenna height.

Although the D3W is rather expensive at a list price of $200, it is much nicer than a set of wire dipoles for doing the same job. The wire dipoles, if fed from a single feed-point, would require support points for the center insulator and each dipole end, for a total of seven. The D3W uses only one support.

The antenna is disassembled as easily as it is assembled. I think the antenna would be excellent for portable and field day operations. Just remember to use a container for all the small hardware.

Specific Features

The best features of the D3W are its all-stainless steel hardware, that it turns with a TV rotator, and its capability for portable operation.

On the other hand, the screw clamps for fastening the elements together are too large and require a lot of tightening up.

The D3W is well-built, with typical triband construction. I recommend the antenna with the understanding that it is a rotatable dipole, not a beam antenna.

Included with the antenna instruction was a sheet of information about lightning protection and Cushcraft's series of gas discharge lightning protection devices. Read this information and take the action you deem appropriate for your station's operational and investment safety.

Also included was a general antenna installation sheet on safety—excellent reading. ■

Bill Clarke WA4BLC, aviation writer and well-known reviewer for 73, may be reached at Box 2403, Fall Church VA 22042.

Manufacturer's Specifications

Bands	12, 17, 30 meters
Bandwidth at 2:1 SWR	entire band
SWR at Resonance	1.5:1
Power Ratings	2000 W PEP
Length	34″
Max. Mast Diameter	2″
Wind Load	0.9 sq. ft.
Weight	11 lbs.

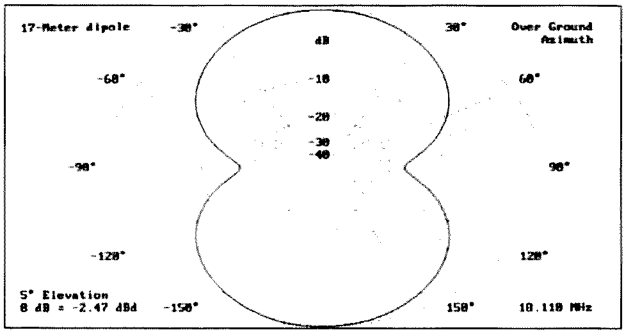


Figure 1. This figure and Figure 2 show the radiation patterns of a typical 17-meter dipole installed at 35 feet.

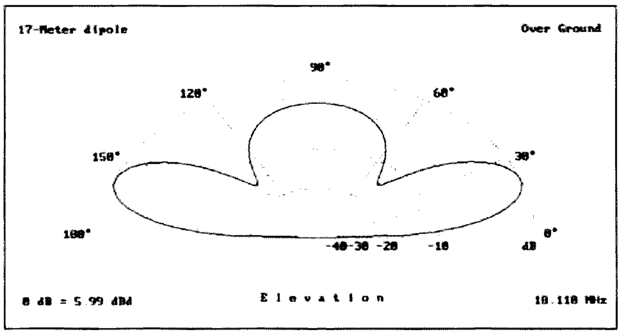


Figure 2. The expected pattern of the D3W on 17 meters when installed at the same height. These patterns were generated by Brian Beezley's MN 2.00 Antenna Software, which the author has found highly accurate.

A "'Rad Radiator'' For Your Walkie-Talkie

Replace your rubber ducky with a dipole.

by Bob Sumption W8MDV

Rubber ducky antennas (or should I say "rubber resistors") are cute and make us look like Kojak, but they are very poor radiators. I decided to confront this problem and come up with an easy-to-construct half-wave vertical dipole to enhance the performance of today's walkie-talkies. Such a dipole would also be suitable for testing to evaluate the rubber ducky's performance.

My walkie-talkie is a Kenwood TH-21, a shirt pocket unit with an output of one watt on high power and 150 milliwatts on low power. I made my own 19-inch whip for the unit because I wasn't able to buy one commercially.

You may already have a 19-inch whip, or have a different type of walkie-talkie. That doesn't matter—this project will work just the same. The wire part of the antenna can be attached to your walkie-talkie with a big alligator clip, or a clip of your own creation. The important thing is that you make a good connection to the ground shell of the antenna connector, as close as possible to the antenna base.

This antenna is not a new idea. I have seen it used elsewhere and I do not claim credit for its invention. My goal was to verify its performance and to inform my fellow amateurs about it.

Photo A. Deanna KA8YVI talking to Tony KB9AFW through the Plymouth, Indiana, repeater, WA9INM, 42 miles away.

Building the Whip

I built my antenna from an old scanner whip, a Radio Shack audio adapter (part number 274-389), a one-inch piece of #12 bare wire, and the center pin from an old solder-on phono connector. I used only part of the whip: a segment four sections long that would extend exactly 19 inches out of the connector shell when finished.

To make the whip, remove the pin from the center of an RCA solder-on connector and solder it to the #12 wire. Remove the plating from the bottom of your whip sections, using a file and tiny knife to do the inside. Drill out the top of your Radio Shack connector shell (I used the shell only) so it is straight and doesn't have a lip at the top. You can adjust the length slightly by shortening or lengthening the #12 bare wire. Remember to leave enough to allow 19 inches from the top of the connector shell to the tip of the whip when finished. Mine is exactly 19 inches, but a half inch more or less should be okay. Also, make sure that the center pin of the connector doesn't extend too far into the walkie-talkie. The Kenwood TH-21 has components right under the connector and you could damage them with a long connector pin.

When assembling your whip use the original rubber ducky antenna connector as a guide. I made mine too long and had to shorten it on the grinder. Luckily, I did not damage my walkie-talkie.

When you have the length correct, insert the whip and connector assembly into the connector shell. This is a good time to test the fit of the assembly on the unit. Make sure it all fits and the connector shell threads match your unit. When you are sure you have it correct, jam the bottom of the connector full of wadded-up pieces of masking tape and pack them tightly all around the connector pin. Next, mix up some epoxy glue and work it down around the whip until the connector is filled. I clamped my whip assembly into a vice to do this, then let it set overnight. Be sure to center the whip so that it doesn't short out to the connector shell. Also, extend the whip before gluing so you don't glue all the whip segments together. That was another goof I made once. When finished you should have a nice whip to use on your radio.

For the bottom half of the dipole use a piece of stranded hookup wire soldered to a piece of thin sheet brass (from the hobby shop) ⅛" wide by 1" long. Bend this piece into a C shape and slip it snugly over the outside of the connector shell. The wire is 19 inches long and hangs down when using the radio, forming the other half of a vertical dipole antenna.

How Well Does it Work?

My daughter Deanna KA8YVI helped with the performance testing. We tested the whip using a Wavetek field strength meter. The Wavetek had a 19-inch piece of wire on it that hung down the side of the table. The walkie-talkie, set on another table with the Wavetek fifteen feet away, was on high power with one watt output.

Test Results:
Readings on the Field Strength Meter

Rubber ducky antenna	11 dB
Whip alone	13 dB
Whip with wire	18 dB

These results show an improvement of seven dB over the rubber ducky antenna when using a full-size vertical dipole.

To verify the results on the air, we used the HT to work several repeaters. One of them was the WA9INM repeater 42 miles away in Plymouth, Indiana. The antenna of this repeater is at 400 feet. Deanna talked to Tony KB9AFW south of Plymouth through this repeater.

The new antenna made the difference between no contact at all and solid copy. I performed a simplex test with Dennis KA8BND in Buchanan, Michigan, over 20 miles away. Dennis reported that he could hear a signal when I used the rubber duck but he could not copy me. With the new vertical dipole it was again Q-5 copy. Dennis reported he was using a double trombone antenna at 25 feet.

In evaluating this antenna bear in mind that all rubber ducky antennas are not created equal, so comparisons with other walkie-talkies and rubber ducky antennas may vary.

Bob Sumption W8MDV has been licensed since 1958. He is now an Extra and works as a Laboratory Electronics Technician for Allied Signal (Bendix Division) in South Bend, Indiana. Bob is part of a ham family: His XYL Diane, daughter Deanna, and son Mike all hold Technician licenses. Contact Bob at 61250 Cass Road, Cassopolis MI 49031.

Number 12 on your Feedback card

LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Avenue
Saugus CA 91350

In Search of Sarex-90

On September 29, 1988 space shuttle *Discovery* lifted into the warm Florida sky above Cape Kennedy and headed toward space. The world watched with great interest, for this, the 26th American shuttle launch was truly historic. Only two and a half years earlier, the *Challenger* catastrophe had claimed the lives of its crew of seven and kept the nation out of manned space operations as modifications were made to the remaining shuttles to ensure that such an accident would never happen again.

It was a flawless mission. The five veteran crew used their four days in space to deploy a new Tracking Data Relay Satellite (TDRS) and perform eleven major scientific experiments. Riding with the crew were not only the hopes and prayers of a nation, but also the dreams and aspirations of the amateur radio community. Ham radio knew it was destined to return to space.

Personal Memories

It was a chilly late November night in the City of Angels. Excitement was in the air. A few days earlier, from a launch pad 3,000 miles away, the majestic spaceship *Columbia* had risen in splendor and headed skyward. On board the STS-9 flight was the new European Space Agency's *Spacelab*. A new friend of mine, Dr. Owen Garriott W5LFL, would be one of those to man it.

At 8:30 PM local time I stood in the courtyard of what was then the Metromedia Square in Hollywood, in the shadow of a pair of 10-meter Harris dish antennas that were busy beaming signals to the sky. I was not there to transmit. My job was to listen, record and report. In one hand was my trusty ICOM IC-2AT. In the other, a small Panasonic cassette recorder with the audio from the ICOM's speaker jack hard-wired in. On my head was a pair of Senheisser earphones, probably worth more than the handheld and recorder combined. Like thousands of other hams across the nation and around the world, I was waiting to hear the first words from a radio amateur live in space.

Almost to the second predicted, the voice of W5LFL calling CQ from the space shuttle *Columbia* crackled in my ears. Within a minute, Owen was holding his first QSO with Lance Colister WA1JXN in Frenchtown, Montana. 1500 miles away, silting in his hotel room on the 12th floor of the Nassau Bay Hilton Hotel across from the Johnson Space Center, my friend and colleague Roy Neal K6DUE listened over his IC-2AT to the same QSO. At that moment, we both knew that the face of amateur radio had changed forever, and we were proud to have been a part of it.

I find it hard to fathom that a decade has gone by since that first SAREX video planning meeting at Roy's old office at NBC News in Burbank, California. That was mid-1980. Eight years earlier Roy and I had met one another on the old K6MYK 147.24/.84 repeater. I was new to Los Angeles, but the voice of K6DUE was familiar from childhood memories of early NASA launches that featured such names as *Redstone*, *Mercury*, *Gemini* and *Saturn V*. The latter was the rockel that took man to the moon, and it was the voice and face ol Roy Neal that had taken me there and had brought me home. Now, we talked regularly on 2 meters, but it would be two years before we would meet in person.

"At that moment, we both knew that the face of amateur radio had changed forever, and we were proud to have been a part of it."

Making Movies

In a way, you might say that Dave Bell W6AQ is responsible for much of this story. Some of you may remember a ham convention in Las Vegas called SAROC. At SAROC-74, Dave cornered me to ask if I would help as advisor in the production of a short movie titled *Moving Up to Amateur Radio*. This was the era of the long gasoline lines and the general public playing at CB trucker and glorification of 11 meters. CB sets were everywhere, and Dave saw this as a golden opportunity to interest the radio-crazed public in a better form of personal communications called ham radio. *Moving Up To Amateur Radio* was a ten minute hard-sell aimed at showing CBers that there was more to life than coffee breaks, southern-sounding Brooklyn accents, and 10-4 Good Buddy! Its host and star was Roy Neal K6DUE.

1979 brought the three of us together for a second film. This one was the award winning *World of Amateur Radio* which, among other things, brought about my quitting a stable, albeit boring, job fixing VCRs for Sears Roebuck and returning to the business I love best.

The *World of Amateur Radio* was a turning point in another way. During its production, Roy and I became very close friends, and it was then that he shared with me his dream—and the dream of his buddy Owen Garriott—of taking a ham station into space. In the days of *Skylab*, Roy and Owen worked independently of each other. Owen's project, "Skylarc," for "Skylab amateur radio club," died before it could get off the ground. But the idea came back to life a few years later when Owen was assigned to *Spacelab* and General James Abrahamson, the man in charge of the shuttle program, agreed to use ham radio in the project.

Both Roy and Owen became hams at an early age. Owen was in high school when his dad started him studying code and theory at the Enid Amateur Radio Club in Enid, Oklahoma. This interest led him to a doctorate in engineering from Stanford University. He signed on with NASA in 1965 and spent two months in space in *Skylab*. Along with astronauts Alan Bean and Jack Losma, Owen participated in medical experiments, took 40,000 pictures of the sun to study solar flares and 16,000 photos of our planet to help evaluate earth resources. Dr. Garriott said his father's introducing him to amateur radio had the most profound effect on his career.

I heard Owen voice these thoughts two years later as he sat in the 1-G shuttle simulator at the Johnson Space Center. Roy was interviewing him for the first of our ham-in-space videos, titled *Amateur Radio's Newest Frontier*. As Roy's youthful interest in radio had lead him to broadcast journalism and mine to broadcast engineering, Owen's had led him to become an astronaut!

I hung onto a ladder, clutching a 30-pound Sony BVU-110 recorder, thinking that ham radio in space might be the key to getting more young people back to the sciences and back to rebuilding the nation's technological base. A year later, as I stood by Metromedia's satellite dish complex, I knew it was coming to pass. The next few days confirmed my suspicion. If the hams loved working W5LFL, kids and educators were having a heck of a good time just listening in! With the success of W5LFL on *Columbia*, the Shuttle Amateur Radio EXperiment concept was proven, and the acronym SAREX was born.

Forming the Group Mind

In the months before the STS-9/*Spacelab* 1 flight, Roy and I were up to our elbows generating videotape. Al Kaul W6RCL had come on board, working with Roy to build a story. Still, we needed a place to put it all together, with a video editor who understood the topic. A person who would be just as excited as Roy, Owen, Al and myself, and with the eye of an artist to boot.

Frosty Oden N6ENV heard we were looking for an editor and said that he was our man, having edited just about every type of show you can think of. Now with over a decade at CBS Television City, he not only wanted to edit our show, but he wanted us to do it at the CBS facility! How could we afford CBS-TVC on our meager budget? Frosty said not to worry, and set up a meeting between us and the Television City brass. Thus, the "group mind" of Neal, Oden and Pasternak was born, and it has prospered ever since.

Two videos were born from the preparations and flight of Owen Garriott W5LFL. Both were called *Amateur Radio's Newest Frontier*, but the newest included in-flight footage to replace simulations, and footage of actual contacts being made, including the first QSO from space between W5LFL and WA1JXN, and new narrative. Sounds easy, but in reality it meant creating a whole new show, and it was up to Frosty to be visually creative. One evening while Roy and I were away from the edit room having dinner, N6ENV created a 45-second clip depicting the entire history of manned US spaceflight. Many say this is the best clip in the show.

To the Young

If Owen Garriott W5LFL proved that hams could successfully operate from space, it was Dr. Tony England W0ORE who conceived ol this type of communication as a teaching tool. England's 51-F operation was primarily educational with the "DX sport" secondary. He wanted to talk directly with students in their classrooms, and the educational community was more than willing to oblige.

Tony flew on one of the last successful missions of the ill-fated shuttle *Challenger*. Mission 51-F in some ways may have been a precursor of problems to befall the *Challenger* later on. As some may remember, the first attempt at launch occurred on July 12, 1985. With only three seconds to go before ignition of the solid rocket boosters, a coolant control valve in the number 2 engine failed to close, and the on-board computers aborted the mission. By month's end, *Challenger* finally did lift off, but on its way into orbit a computer malfunctioned and cut off one of the engines prematurely. Commander Gordon Fullerton took manual control, and successfully maneuvered the *Challenger* into orbit, thus saving the mission and probably the lives of all on board!

Orbit was attained, but at a much lower altitude than expected. This meant recalculation of time lines for accessing the ham station. By August 1, the first slow-scan television pictures from space were beamed earthward by W0ORE and received at NASA's Jet Propulsion Laboratory (W6VIO) in Pasadena, California, and schools and

private amateur stations around the world.

My memories of this mission are vivid. The day Tony began his operation, I was a part of the Los Angeles press corps, armed with a Sony video camera and recorder borrowed from Dave Bell, at the Chaminade School in Canoga Park, California. A group of students had assembled a world-class station for downlinking pictures from space, and maybe sending some back. Dr. England envisioned the Shuttle Amateur Radio Experiment, or SAREX, to be as much for educating youngsters about space as it was to give his fellow hams the most exotic DX contacts of their amateur careers.

As the appointed hour approached, the teen-age hams manning the Chaminade station grew more mature by the moment. They checked and double checked every calculation of acquisition time and beam heading, using their classroom computer. Mike Sioss, a news photographer from my station who had worked in Houston, remarked on how much the classroom atmosphere resembled Mission Controll Soon, at least 3,000 watts of Lowell lights were ablaze, and a dozen VCRs were rolling tape. The young hams began their routine of calling and listening as cameras zoomed in for close-ups, then widened for coverage. For a solid 20 minutes this routine continued, but to the chagrin of the kids, nothing was received—not one peep from WØORE. Not one chirp of SSTV.

Mike, a KTTV reporter, and I headed over to JPL to see if the ham club there was having any success. Being already credentialed and knowing the way to the W6VIO trailer, I opted to lead the way. En route, I called Dr. Norm Chalfin K6PGX to tell him I was on my way.

Norm met us at the security gate and rode over to the station in our mini-motorcade. The W6VIO crew reported better luck than the kids at Chaminade. They had seen some video on the first pass and were pretty certain that voice contact would be established on the following orbit. Seated at the operating position was then ARRL Southwestern Division Director Jay Holliday W6EJJ, and with the pass due momentarily, Mike and I quickly hung a pair of Sony ECM-50 mikes from the tie of W6EJJ. This time we were partly successful, as depicted later that night on KTTV's 10 PM news and in the SAREX video produced later by the team of Neal, Oden and Pasternak. No, Jay did not make contact, but Tony was at least heard!

It appears that the first successful two-way SSTV contact took place between WØORE and Bryan Davies GW3KYA operating the club station GW3GW from the Blackwood District School in Gwent, Wales on August 2 during orbit 61. As Davies told me, he received a call from the hams at NASA/JSC telling him to keep an ear open. "About ten minutes later, WØORE came up out of the noise. It was marvelous, simply marvelous." The QSO lasted a solid six minutes and included the transmission to GW3GW of an SSTV picture of Tony operating the SAREX rig.

This QSO was significant in another way. It proved something scientifically and strategically important that NASA had been wondering about for years. Could television be sent to an orbiting shuttle? Theory said probably, but ham radio proved the answer was "definitely." This alone may have enhanced the position of amateur radio with NASA's top-brass, and may be one of the reasons we of amateur radio have been invited back on board.

The Bleak Years

After the *Challenger* disaster, when the nation paused to reassess its space program, many amateurs never lost their dream of returning to space. These hams recognized that their future was not in the madhouse of 20 meters nor the insipid repeater kerchunks of 2 meters, so unappealing to the young.

> *"These hams recognized that their future was not in the madhouse of 20 meters nor the insipid repeater ker-chunks of 2 meters, so unappealing to the young."*

The teen-ager of the mid-80s was computer literate. Radio was what you listened to heavy metal music on; two-way radio was the cellular telephone in someone's car. A decade earlier, the public may have confused CB with amateur radio, but now they paid it little attention.

Inside amateur radio, strife was growing as well. Some were openly saying on the bands that kids had no place in the hobby. Club members grew older, colder, and grayer as fewer youngsters came on board. For those who did venture through the carefully guarded gates of Ham Radiodom, the welcome was often far from warm. Amateur radio was not just dying, it was committing suicide.

But there were some who remembered the lights in the eyes of young ones who heard that voice from space, as Owen Garriott and Tony England talked or sent television pictures from orbit. While the nation's youth may have become complacent about nearly every other facet of life, spaceflight still intrigues them. Check the demographic breakdown of audiences for television shows like *Star-Trek, The Next Generation*. By and large, its audience is young and intelligent.

The *Challenger* disaster brought to view a subtler tragedy, one that Wayne Green had recognized and harped on for years: The loss of technology from this nation to foreign shores. In the 80s the yuppie, young upwardly mobile professional, surfaced. Interest in scientific achievement was replaced by avarice. Colleges and universities which had been creating the nation's technological base were now turning out lawyers and accountants. The goal was instant success and wealth, at all costs. Technology was something to be sold at a profit to Japan, Korea or the highest bidder.

Without a sound base in science and technology, a nation must depend on other nations for technological survival. As I look around me I see only this computer as a predominantly US made product, and even it incorporates some foreign manufactured integrated circuits. The TV, VCRs, and ham gear are marked "Made in Japan."My cassette and microcassette recorders, marvels of miniaturization, are not our nation's technology. Our latest acquisition may bear the name General Electric, but closer inspection reveals the words "Manufactured in Korea." Examining the products in my home was a real eye-opener. With the exception of a decade-old microwave and a six-year old RCA teleset, I couldn't find any electronic device made in the United States!

The Voyage Home

In *Star-Trek IV, The Voyage Home*, a small group of time-travelers was able to save the earth from destruction due to human short-sightedness. Since humanity had killed all the whales, there were none to communicate to the powerful outsider that all was well. To save the planet, Capt. James T. Kirk and his crew used a Klingon "Bird of Prey" to travel back in time and bring two of the giant mammals to the future. Their success meant salvation.

In like manner, I feel that SAREX-90 could begin the salvation of the United States. These two flights will catch the attention of youngsters, bringing the marvel of amateur radio communication into their world. While few children will get the chance to speak to the astronauts directly, many will be able to send written questions. Communication to the spacecraft will be relayed from Australia and possibly Africa and South America. Ham clubs can help by providing the equipment, whenever possible, for listening in.

As Capt. Kirk and his crew used the past to save the future, some of our amateur radio leaders are doing the same. The basic SAREX technology is known to work, so in SAREX-90 we are turning a good part of it over to the next generation to entice them into careers in science and technology.

SAREX-90 by itself will not rebuild the nation or ham radio. Nor will no-code. But, as the last SAREX-90 flight comes to an end, we can expect the introduction of a no-code license. The timing couldn't be better. With SAREX fresh on their minds, and an easier entry into amateur radio, there is no telling how many vital young hams may come to the service, and become the engineers who rebuild the nation's technological base.

The success of SAREX-90 could bestow a great future on our service. Before the turn of the century, NASA plans to have *Space Station* built and operational. *Space Station* will be a habitat where astronauts will live, work and play on long missions. Plans are already underway to make amateur radio a permanent part of *Space Station*, for both back-up communications and recreation. This will be amateur radio's gateway to outer space.

Number 14 on your Feedback card

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston TX 77083

Beyond Microsats

On Wednesday, February 7, 1990, Fuji-OSCAR-20 was sent into orbit from the Tanegashima Space Center in southern Japan. It was launched on an H-1 rocket with Marine Observation Satellite 1B and the experimental DEBUT satellite. F-O-20 is performing flawlessly.

F-O-20 has both digital and analog Mode J transponders. All uplinks are on two meters with downlinks on 70 cm. The digital package is identical to the now silent F-O-12. It uses packet AX.25 protocol with four discrete FM uplink channels and BPSK (biphase shift keying) for the downlink. The analog transponder is 100 KHz wide and inverting. A lower sideband signal transmitted by a ground station high in the transponder passband will be heard on upper sideband low in the downlink passband.

Thanks to efficient gallium arsenide solar cells and a larger surface area available for cells, F-O-20 has much more power available for the communication and command systems than F-O-12. The power output is more than 10 watts at the beginning of life in orbit. F-O-12 had only 6.5 watts available. Power budget problems kept F-O-12 from lasting more than a few years.

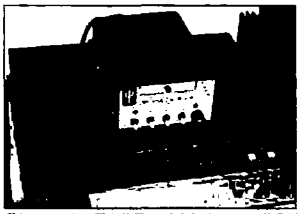


Photo A. TAPR 1200 baud PSK modem hooked up to a packet TNC and ready to go for Microsat or Fuji digital communications. (WA5NOM photo)

The need for lengthy recharge periods with the computer off hampered BBS activity, since the memory would be erased after only a day or two of activity. F-O-20 should be able to maintain the memory during charge or strictly analog operating periods. Enough power may be available to run both the analog and digital transponders simultaneously.

More details on F-O-20 (known as JAS-1b prior to launch) can be found in the September 1989 "Hamsats" column in *73*. The September 1969 issue of *QEX* from the ARRL carried the article "Introduction of JAS-1b," from the JARL (Japan Amateur Radio League).

Taking Stock

Since the beginning of the year, SEVEN new amateur satellites have been launched. Table 1 provides data on the systems of each.

Today we have 10 active hamsats, if you include the intermittent activity of AMSAT-OSCAR-10. Unfortunately, little has been heard from UoSAT-OSCAR-15 since January 22. Experiments on U-O-15 include a camera imaging device, transputer data processing units and advanced European-made solar cells. Efforts are underway to determine why it has not been transmitting.

The microsat launch program has strained AMSAT's budget. If you have been thinking about joining, now is the time. Your support is needed. Contact AMSAT at (301) 589-6062. You can also write to: *AMSAT, 850 Sligo Ave. #600, Silver Spring MD 20910.*

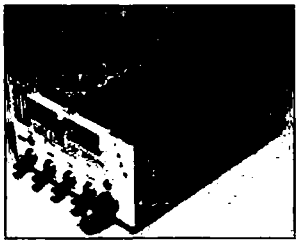


Photo B. Inside view of the TAPR 1200. (WA5NOM photo)

Membership is $30.00 per year and includes a subscription to the current newsletter and discounts on software. Dues pay for publications, salaries for AMSAT's two paid employees (everyone else is a volunteer) and more hamsats. Look at it as an investment in amateur radio's future.

AMSAT-OSCAR-10 provides Mode B (70 cm up and two meters down) operation whenever the solar panels are properly illuminated. The apogee of this satellite's orbit has drifted to the south giving excellent operation to South America, Africa and the South Pacific, including Australia and New Zealand. The on-board computer no longer functions due to radiation damage to the memory circuits.

UoSAT-OSCAR-11 continues to send telemetry using 1200 baud Bell 202 format tones on 145.825 MHz FM. Bulletins of interest are sent between frames of telemetry. On selected days, the digitalker can be heard speaking telemetry numbers in easily-understood English.

AMSAT-OSCAR-13 is still the most versatile satellite with Mode B, J, L (23 cm up and 70 cm down) and S (70 cm up and 13 cm down) transponders. The apogee of its elliptical orbit has been drifting slowly northward. Roundtable contacts between hams in Asia, Europe and North America are now very common.

UoSAT-OSCAR-14 is performing well with 1200 baud ASCII downlink signals on 70 cm. The satellite has cosmic particle and total radiation dose detection devices, along with a packet radio communications experiment. It will be available for digital communications when the control operators have qualified its on-board systems. Signals are loud and can be decoded on units like the PK-232 that have been hardware-modified for inverted mark/space tones. Any system capable of downloading from U-O-11 is ready for U-O-14, if it has an appropriate 70 cm FM receiver.

PACSAT-OSCAR-16 is now available for store-and-forward packet operation. The digital transponder is completely compatible with any station that operated through F-O-12's Mode JD digital system. Sponsored by AMSAT-NA, and monitored by control stations here in the States, this satellite provides a useful link for terrestrial packet systems. Gateway stations will be set up in major metropolitan areas for message forwarding through this hamsat.

The DOVE

DOVE-OSCAR-17, sponsored by BRAMSAT (AMSAT Brazil), has become extremely popular. With over four watts output on 145.825 MHz, it can be heard by almost any two meter FM radio. Many home stations with only small omnidirectional antennas can hear the signals and receive the standard packet telemetry. There have been many reports from enthusiasts with only HTs and "rubber duck" antennas.

DOVE stands for Digital Orbiting Voice Encoder. When the ground-control stations both here and in Brazil get operations sorted out, the voice operations will begin. We expect that voice will dominate over packet by a four-to-one ratio.

Two forms of digital voice are possi-

Table 1. Frequencies and modes of the new Hamsats.

UoSAT D	UoSAT-OSCAR 14 or UO-14 or UO-3
Uplink	145.975 MHz 9600 bps AFSK (FM)
Downlink	435.070 MHz 9600 bps AFSK (FM)
	G3RUH or K9NG 9600 baud modem or
	435.070 MHz 1200 bps AFSK (NBFM
	Standard Bell 202 modem
UoSAT E	UoSAT-OSCAR 15 or UO-15 or UO-4
Downlink	435.120 MHz 9600 bps AFSK (FM) AX.25
	G3RUH or K9NG 9600 baud modem or
	435.120 MHz 1200 bps AFSK (NBFM)Standard Bell 202 modem
Note: CCD camera, 740x960 km view. Sat. not heard since launch day.	
PACSAT	AMSAT-OSCAR 16 or AO-16
Uplink	145.900, 145.920, 145.940, 145.960 MHz
	AFSK (FM) 1200 baud AX.25 Manchester
	Normal PSK Downlink437.02625 MHz 1200 bps BPSK (SSB) AX.25
	Raised Cosine Downlink437.05130 MHz 1200 bps BPSK (SSB) AX.25
S-Band Downlink	2401.1428 MHz 1200 bps BPSK (SSB) AX.25
	TAPR or G3RUH or PacComm PSK modem
DOVE	DOVE-OSCAR 17 or DO-17
FM Downlink No. 1	145.82516 MHz 1200 bps AFSK (FM) AX.25 or digital voice messages
FM Downlink No. 2	145.82438 MHz 1200 bps AFSK (FM) AX.25 or digital voice messages
	Standard packet TNC for either signal
S-Band Downlink	2401.2205 MHz 1200 bps BPSK 1 watt
	TAPR or G3RUH or PacComm PSK modem
WEBERSAT	WEBER-OSCAR 18 or WO-18
Normal PSK	
Downlink	437.07510 MHz 1200 bps BPSK (SSB) AX.25
Raised Cosine	
Downlink	437.10200 MHz 1200 bps BPSK (SSB) AX.25
	TAPR or G3RUH or PacComm PSK modem
ATV NTSC Uplink	1265.000 MHz AM-TV
Note: CCD camera, 350 x 350 km view	
LUSAT	LUSAT-OSCAR 19 or LO-19
Uplink	145.840, 145.860, 145.880, 145.900 MHz
	AFSK (FM) 1200 bps AX.25 Manchester
Normal PSK	
Downlink	437.15355 MHz 1200 bps BPSK (SSB) AX.25
Raised Cosine	
Beacon	437.12580 MHz 1200 bps BPSK (SSB) AX.25
	TAPR or G3RUH or PacComm PSK modem
LU-AMSAT CW	
Beacon	437.125 MHZ 12 wpm CW telemetry 750 mW
Microsats AO-16, DO-17, WO-18, LO-19	
Maximum RF power output: 4.0 watts	
Raised Cosine (PSK) transmitter PEP: 9.0 watts	
S-Band transmitter output: 1.0 watt	
BPSK units are capable of 4800 baud operation in addition to 1200 baud.	
Fuji Oscar 20 or FO-20 or JAS-1b	
JA Uplink	145.900 to 146.000 MHz
JA Downlink	435.900 to 435.800 MHz 1 watt
JD Uplink	145.850, 145.870, 145.890, 145.910 MHz
	AFSK (FM) 1200 bps AX.25 Manchester
JD Downlink	435.910 MHz 1200 bps BPSK (SSB) AX.25
	TAPR or G3RUH or PacComm PSK modem
JA Beacon	435.795 MHz 100 mW CW

Photo C. At W5RRR, the Johnson Space Center ham club, during the Microsat launch (L to R): WD5GAZ, N5FVM, WA5LHM, N5JXS, N5LKJ, WA5NOM and K5ZC.

ble. The system is capable of creating voice by using phoneme building blocks, or it can reproduce messages that have been recorded on Earth, digitally encoded, transmitted to the satellite and stored in memory. A possible use for DOVE is to send AMSAT bulletins by satellite similar to the method used by U-O-11, but with two distinct differences. DOVE has much more transmitter power, and it can send standard packets. Anyone with a simple omni antenna and a packet TNC (terminal node controller) can get the bulletins. Six hours after a control station uploads a bulletin to the satellite every person on Earth interested in receiving the message will have had a pass to do so. Scheduling the use of this extraordinary resource will be the responsibility of BRAMSAT's president, Dr. Junior Torres de Castro PY2BJO, and others in the BRAMSAT organization.

And More . . .

WEBER-OSCAR-18 has begun picture transmissions. The CCD (charge-coupled device) camera has taken many pictures for downloading via the BPSK 70 cm transmitter. Several of the first pictures were dark since the camera was aimed toward space, but the ninth picture, although blurry, was of the Earth. This encouraged ground control stations at Weber State University in Ogden, Utah, to get WEBERWARE picture-decoding software out and available to AMSAT control stations. The satellite has several experiments on board, but the imaging activities have proved to be the most popular. Check with AMSAT-NA for prices on WEBERWARE. Substantial discounts are available for members. AMSAT also has tracking software for most popular computers.

LUSAT-OSCAR-19 sponsored by AMSAT Argentina is virtually identical to P-O-16 except for its CW-telemetry beacon on 70 cm and the placement of the attitude alignment magnets. Its orientation slightly favors the Southern Hemisphere. The CW beacon from this microsat was one of the first signals heard by stations monitoring the launch and listening for signals from the new satellites. On-board systems are performing extremely well.

Fuji-OSCAR-20, as noted above, is our newest hamsat and provides an analog (voice and CW) transponder in addition to a digital communications system. One station, KA5DNP, reported three sideband contacts on one pass using 50 watts on the two meter uplink to an attic-mounted groundplane antenna, and a nine-inch copper loop on a wooden curtain rod in the shack with a preamp for the 70 cm downlink. Satellite operation need not require expensive equipment.

Photo E. WA5LHM and WA5NOM check orbital predictions for the new Microsats shortly after launch.

RS-10/11 from the U.S.S.R. has continued with Mode A (two meters up and 10 meters down) operation. Reports from RS3A at Moscow University indicate there has been some difficulty uploading commands to RS-10, but no serious interruptions to satellite use are anticipated. The ROBOT autotransponder has been off during periods when its memory buffer has been full and not yet cleared.

RS-11, which is physically attached to RS-10, is still operational but is not active when RS-10 is on. RS-11 probably won't be usable until RS-10 becomes uncommandable from the ground.

SAREX Update

The March "Hamsats" column featured information about the upcoming SAREX (Shuttle Amateur Radio EXperiment) mission originally scheduled for April 1990. It now looks like there will be a May launch. The astronauts will be able to watch for access to specific ground stations by using software developed by W5SXD and WB5CCJ of Silicon Solutions, a Sugarland, Texas, company. The modified version of SSI's GrafTrak 2 will run on the GRID computer used by Ron Parise WA4SIR during the mission. 73

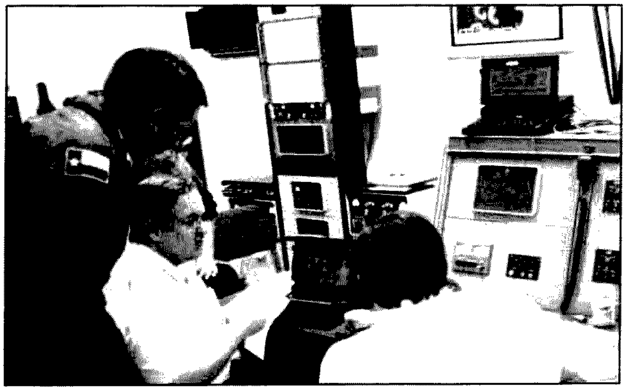


Photo D. N5LKJ, WA5NOM and N5JXS get ready for the first signals from the Microsats at W5RRR.

UPDATES

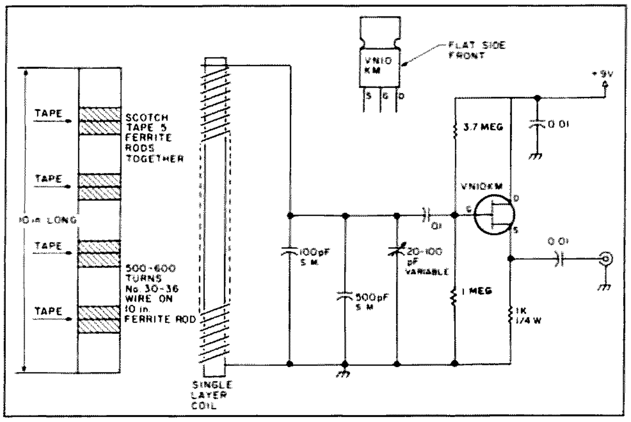
Number 15 on your Feedback card

USS Drum Special Event

Refer to "Special Events" in the April issue. The Special Event Station K4RQQ, operated on April 11th by the Mobile ARC from the radio room of the of the submarine *USS Drum*, is commemorating the 90th (NOT the 75th) anniversary of the US Naval Submarine Service.

ICOM America Service

The ICOM Service Survey by Gordon West WB6NOA, scheduled to appear in this issue, has been moved up to the June issue. Look for it then!



See the "Above and Beyond" schematic on page 45 of the February 1990 issue. This is the corrected schematic (the 3.7 and 1 meg resistors had been left out), with improvement (note the 0.1 μF capacitor between the coil and gate), for the 60 kHz ferrite rod antenna's FET amplifier.

Number 16 on your Feedback card

Ham Television

Bill Brown WB8ELK
c/o 73 Magazine
Forest Rd
Hancock NH 03449

Figure 1 "ShuttleVision" via the Daytona Beach ATV repeater.

The Video Generation

There has been a lot of discussion lately about ways to entice young people into ham radio. With all of the electronic distractions available these days, which do you think the typical teenager will choose: 1) Playing the latest video game on their Whizbang 2000 computer or 2) Working CW on the novice bands? Tough choice, but I imagine the computer will probably win out! We may have lost many potential new hams now that affordable home computers have found their way into most households.

If only we could enhance the use of computers through ham radio! Wouldn't it be great if there were a way to actually show your friends your latest computer program directly on their TV sets? Amateur Television (ATV) just might be the answer! With a ham radio license you can legally set up your own TV station and show off your latest computer wizardry!

How many of you have had trouble getting a new program to run or needed help figuring out your new computer? It's tough explaining the fine points of a program on the 2 meter rig or over the phone. If one of our local ATV group members needs an answer, he just pops the computer screen on the air and gets immediate feedback. We've spent hours demonstrating our latest graphics and quickly learning the fine points of each new software acquisition.

If new ham clubs can be started in schools (maybe as part of a computer club), it wouldn't take a lot to include an ATV station. If local ATV activity exists, you may only need a UHF antenna, a downconverter and a TV set to start watching it. Most schools have an audio-visual department who might loan a school ham club the necessary video camera, VCR and TV to start putting together a transmit station.

ShuttleVision

Many ATV repeaters and individual ATV stations retransmit live video from the space shuttle during each mission. This can be legally relayed from the NASA Select satellite feed received by any home satellite dish. This feed is on SATCOM F-2, channel 13 and shows mission activities from various NASA centers as well as all video downlinks from the shuttle.

One of the goals of the upcoming Shuttle Amateur Radio Experiments (SAREX) will be to involve as many schools as possible. Over 4000 schools can tie into a special NASA phone line computer BBS to list out missions activities during each flight. Also, audio communications between the astronauts and mission control can be linked via 2 meters into many of these schools. The ultimate goal would be to actually relay the satellite video feed directly to the classrooms via ATV.

Spread the Word

A list of ATVers and ATV repeaters who relay shuttle video is being compiled so that interested schools can tune in. Here's your chance to help put shuttle video into the classroom. If you or your ATV group relays "ShuttleVision," please let us know the location and callsign of the ATV transmitter or repeater, output frequency, antenna polarity, and a local contact address or phone number. Send this information to Tom O'Hara W6ORG, 2522 Paxson Lane, Arcadia, CA 91007-8537, so that it can be included in a SAREX information package being sent to schools.

Amateur radio will be carried into space by the shuttle on two missions this year. On May 9th, Ron Parise WA4SIR will operate a packet TNC on 2 meters with a ROBOT QSO capability aboard STS-35. Also, voice contacts will be attempted with schools around the world.

Of particular interest to the ATV community will be the STS-37 mission scheduled for November 1st. Lt. Col. Ken Cameron KB5AWP will be looking for two-way SSTV, packet, and voice QSOs on 2 meters. In addition, selected ATV uplink stations will attempt the first live video transmissions to the shuttle. Due to bandwidth restrictions for space communications on the 70cm band, a special temporary authorization (STA) from the FCC is required. Only a limited number of ATV uplink stations will be approved for this event. These stations will be located at radio clubs at the various NASA space centers as well as at Motorola. Motorola supplied the 2 meter HT and the special dual-band antenna which will be mounted in the pilot's or co-pilot's window of the shuttle.

The goal of this part of the SAREX experiment is to send special video presentations up to the astronauts. VIP messages, greetings from the astronauts' wives, and educational messages, will be uplinked. Although QSOs with the general ATV community will not be made, you can participate with this effort by helping to distribute the satellite TV downlink. The NASA select satellite feed will be providing a good deal of coverage of the amateur radio activities during both missions and will be highlighting the ATV uplink transmission from the Johnson mission control center in Houston. If this experiment proves to be successful, we can expect future SAREX missions to carry ATV receive and transmit equipment for two-way QSOs with ATVers worldwide.

WEBERSAT Update

Digitized pictures from the onboard color CCD TV camera have been sent down from the orbiting WEBERSAT. The picture is relayed via packet data on 437.100 MHz and it takes two passes to retrieve all of the information. Currently they are sending down one new picture each day. Since the satellite is spinning and the field of view of the camera is 20 degrees, many of the initial pictures will be of open space until the spacecraft orientation with respect to the Earth can be predicted.

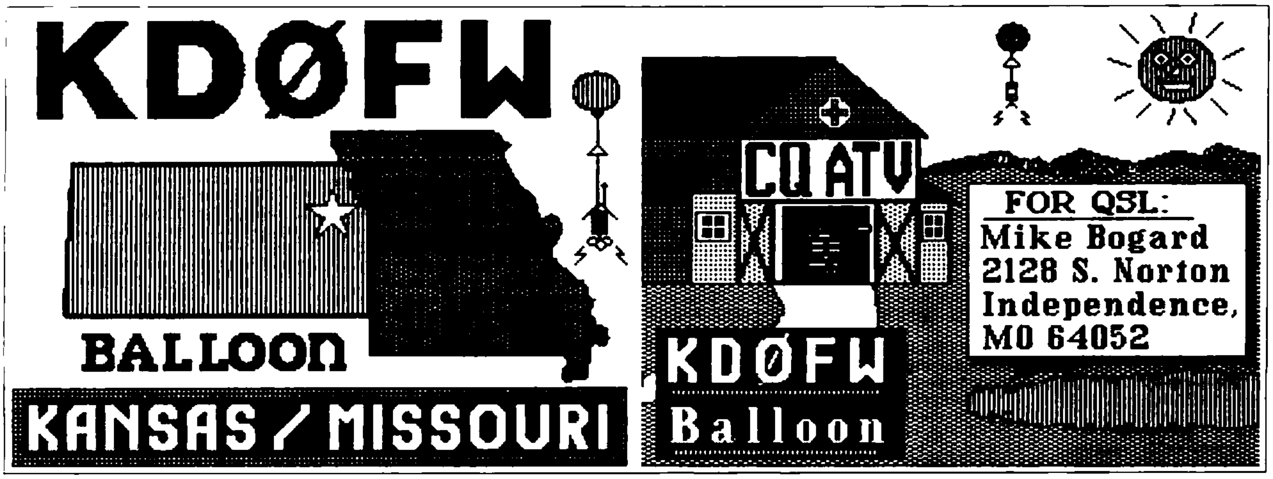


Figure 2. Computer screens transmitted from the balloon

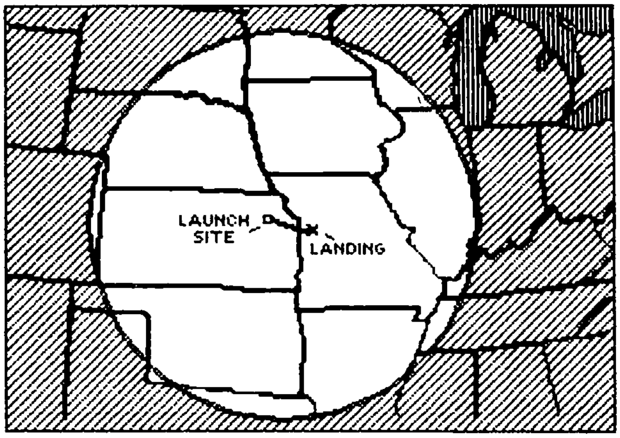


Figure 3. 393-mile range from Kansas City.

However, at this writing a few pictures of the Earth have been successfully received by the command station at Weber State College. A program called WEBERWARE 1.0 should be currently available to decode the raw packet data transmissions. You will need an IBM PC with at least an EGA display. This program is available from AMSAT, PO Box 27, Washington, D.C. 20044.

The ATV uplink experiment on 1265 MHz will be attempted this spring and summer. Here's your chance to have your ATV signal seen by hams all over the world! If you have at least 18 watts on 1265 MHz and an Az/El mounted antenna, please send your address and phone number to me at the above address, so that we may coordinate uplink contacts.

Kansas Balloon

Mike Bogard KD0FW started out the year with an exciting ATV balloon flight from the Kansas City area on February 10th. Mike put together a 3 watt ATV transmitter on 439.25 MHz with a P.C. 80 mW exciter into a Motorola MHW-710 power brick. This system was run at about half the power output in order to conserve battery life of the lithium cells. The video source consisted of 4 computer screens with a VDG-1 video ID displaying QSL information and pictures of Kansas complete with a farm scene.

Also included was a 50 mW, 2 meter transmitter on 144.34 MHz with a voice IDer made by Carl Lyster WA4ADG. Outside temperature was determined by the length of time between voice IDs through use of a thermistor sensor (gets down to −68 degrees at the higher altitudes!) and internal temperature was determined via the video screen timing. This was packaged in styrofoam, complete with an omnidirectional Big Wheel ATV antenna (W6OAL design) and a 2 meter, quarter-wave whip.

Mother nature decided to make things difficult and hit Mike with 20 knot gusts of wind during the hair-raising launch. At times, the 5-foot weather balloon was stretched out 20 feet, looking like a large cigar! Liftoff occurred at 1622 UTC from just west of Lawrence, Kansas.

Even if you're beyond the coverage of one of these flights, it's great fun to listen in on the excitement of the 40 meter balloon net. Bill W0ZMR kept us informed of the balloon's flight progress. It sounded just like a space launch with the reception reports coming in from increasing distances. At the maximum altitude of 95,000 feet, the ATV signal was received in over seven states. The furthest reception was by a group from Denver who ventured out to the "highest" point in Kansas. From their vantage point on Mt Sunflower, near the Kansas/Colorado border, W6OAL, AA0P and WB0TUB were rewarded with a nearly snow-free color picture at a 393-mile range!

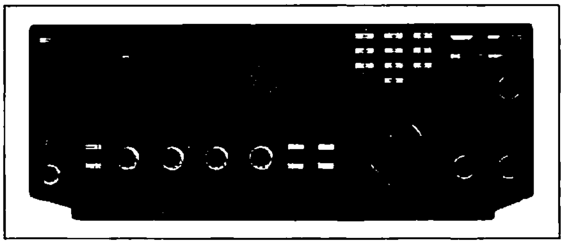
Balloon packages tend to land in strange and "peculiar" locations. Sure enough, the payload parachuted down into the top of a 60-foot tree just south of Peculiar, Missouri! Thirteen chase vehicles converged on the scene in a matter of minutes. Paul W9DUU was close enough to actually see the parachuting package as it drifted down towards its landing site. After sawing down part of the tree with a chainsaw and shooting at the string a dozen times with a shotgun, Mike was finally able to loop a line around the package to pull it down for a soft landing.

These balloon events are a great way to get your whole group involved, and certainly seems to stir up more interest in ATV wherever they occur. Several ATV and packet balloons are planned this spring and summer. Watch your local packet BBS for information. Also, listen in to the ATV net on 3.871 MHz every Tuesday night at 8 PM for updates on balloon flights. WEBERSAT and finding local ATV activity. Stay tuned. ■

Number 17 on your Feedback card

NEW PRODUCTS

Compiled by Hope Currier



PRODUCT OF THE MONTH

ICOM AMERICA, INC.

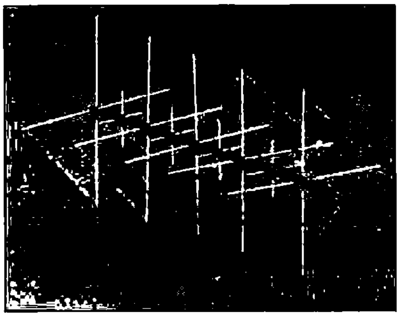
Project yourself into the 21st century with ICOM's new IC-970 all-mode multiband transceiver. Designed for the serious operator on 144, 440 and 1200 MHz, the IC-970 provides futuristic technology for DX, digital and satellite communications.

The IC-970 comes fully equipped as an all-mode dual-bander for 144 and 440 MHz. You can operate the 1200 MHz band by installing the UX-97 band unit, or you can listen to what's happening in the world with the UX-R96 wideband receiver, receiving 50–905 MHz continuously. This unit can receive both main and subband audio simultaneously. Multiple scanning systems also function concurrently on the main and subbands.

This transceiver makes satellite communications easy. It automatically tracks uplink and downlink frequencies when the tuning control is rotated, and has 10 memory channels specially designed for quick satellite communications.

For price contact: *ICOM America, Inc., 2380 116th Ave. N.E., PO Box C-90029, Bellevue WA 98009-9029.* (206) 454-8155. Or circle Reader Service No. 201.

CUSTOM ANTENNA



The Model DB2/70 dual-band quad antenna from Custom Antenna Systems is a compact, lightweight, high performance beam with five elements for two meter and nine elements for 70 cm. It is broadbanded, offers 12.5 dB forward gain on two meters and 10.5 dB on 70 cm, and has a front-to-back ratio of 20 dB.

The DB2/70 is only five feet long and uses a 1"-13/8" mast. It is end-mounted, making it easy to install using only a light rotor. The match system provides low SWR with a 50 ohm feed and a standard PL-259 connector. This beam needs only one feedline, but you can also feed both bands separately with a second feedline. The antenna weighs approximately 3½ pounds and will handle a wind load of 90+ MPH.

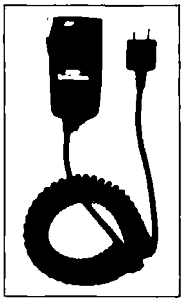
The Model DB2/70 is available for $110, plus S & H, from *Custom Antenna Systems, PO Box 17012, Munds Park AZ 86017. (602) 286-1236.* Or circle Reader Service No. 203.

THE RADIO WORKS

The RemoteBalun© from Radio Works provides a simple way to convert your 80 or 40 meter dipole to all-band operation, including the WARC bands. You can use ladder line to feed your antenna, mount the RemoteBalun outside the house, attach the ladder line to the balun, then route low-loss coax to your transmatch. This eliminates the inconvenience of getting the ladder line into your shack, offering you the convenience of balanced feeders plus the ease of coaxial cable.

The RemoteBalun system has a special twin-core design that overcomes core saturation, poor output balance, RFI, and signal distortion. The power rating is 1.5 kW in low duty cycle CW and SSB applications.

The price is $27. Optional low-loss interconnect coaxial cables are available with PL-259 connectors installed. A complete all-band Universal© antenna and RemoteBalun are available for $60. Contact *Radio Works, Box 6159, Portsmouth VA 23703. (804) 484-0140.* Or circle Reader Service No. 204.



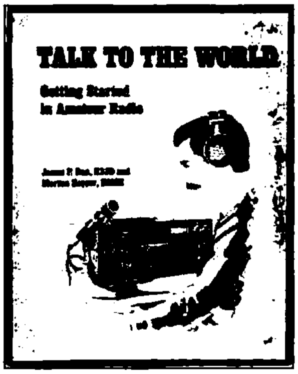
MFJ

MFJ has released several new new miniature speaker/microphones for Kenwood, ICOM, Yaesu and other handhelds. These speaker/mikes are available with regular or "L"-shaped connectors. They measure just 2" x 1¼" x ¼" yet provide a first-rate electret mike element and a wide-range speaker for superb audio on both transmit and receive. They also have an earphone jack for private listening, a PTT button, a swiveling lapel/pocket clip and a lightweight retractable cord.

The price for each model is $25. Contact *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762. (601) 323-5869.* Or circle Reader Service No. 206.

TAB BOOKS

Talk to the World: Getting Started in Amateur Radio by James P. Dux K3JD and Morton Keyser N3MK is for anyone who wants to know what ham radio is all about but doesn't want to spend a lot of money finding out. It is designed to help beginners get started and stay involved. In addition to providing information and practical tips on obtaining a Novice license, the authors take the mystery out of the technical and procedural aspects of ham radio. Emphasizing what is practical, low-cost and effective, they describe in comprehensible language how to obtain and set up equipment, organize a ham shack, put up antennas, and understand the special jargon and operating protocols on the various bands and modes. Also included are a chapter on ham radio for the handicapped and a glossary.



Talk to the World: Getting Started in Amateur Radio (ISBN 0-8306-3183-6) is available in paper only, suggested retail price: $12. For more information contact *TAB Books Inc., Blue Ridge Summit PA 17294-0850. (800) 822-8138.* Or circle Reader Service No. 205.

SURPLUS SALES OF NEBRASKA

Don't tie up your PC for packet when you can dedicate an RCA "APT" terminal to the job. Plus, when you're not hamming, you can use the built-in modem to access information services like CompuServe or a local bulletin board. Other features include video or RF outputs (allowing you to use either a monochrome monitor or a TV set), a parallel printer port, an RS-232 interface (DB25) for direct connection to the packet controller, acoustical coupler input and auto log-on.

This terminal, originally priced at $500, is now selling for $75 from *Surplus Sales of Nebraska, 1315 Jones Street, Omaha NE 68102.* (402) 346-4750. Or circle Reader Service No. 202.

PACKET TALK

Number 18 on your Feedback card

Latest in Digital Hamming

Edited by the B.H.L.N.

Smart Packet Software

This month let's look over some *smart* software for your packet station. One very versatile terminal/communications program is LAN-LINK for the IBM PC and compatibles.

LAN-LINK is a very comprehensive program which will work with a number of different TNCs. Many different configurations can be established via the colorful menu screens. Packets are displayed in different colors depending on whether they are monitored headers or ones sent to you during a connect. Also during a multi-connect the different streams can be displayed in distinctive colors.

For those of you who look with bewilderment at all the different parameters that can be changed on your TNC, fear not! When first started, LAN-LINK will automatically set up your TNC for the optimum configuration for either VHF or HF.

One particularly nice feature is the automatic BBS download function. Instead of waiting for hours to log onto your local BBS, you can set up LAN-LINK to access the BBS when it's clear, to read your mail and look for special items (such as AMSAT bulletins), and to log off the system without so much as one keystroke. You can even set it up to look for your call in the BBS mail beacons. If you have mail waiting for you, LAN-LINK will automatically log onto the system and download your messages.

Each packet contact is also automatically entered into a logbook section for future reference.

Other modes, such as AMTOR, are also supported, as well as a robot QSO mode which allows your computer to automatically work and log stations.

SAREX Features

Version 1.55 of LAN-LINK has a number of features specially designed for ground stations trying to work SAREX, copy telemetry from the Microsats, and do other special activities as described below:

The Attack or "Go For It" Mode. If the Attack Mode is set, LAN-LINK will issue a connect request to WA4SIR-1, or any other desired station, whenever a packet sent to or from it is heard. Be careful using this feature, as it has the potential to cause a great deal of QRM. It can also be cleared by another station connecting to you and telling you to ":QRT:".

Blind Connect Scheduler. In case you think that the ROBOT may be turned on in the middle of a pass before you hear a packet, you can give LAN-LINK the start time and the end time of the pass, and the time interval between the connect/call attempts. At the given start time, LAN-LINK will issue a connect request, and keep trying until either it succeeds or the pass ends. The first connect that goes through will inhibit the scheduler.

Telemetry Capture. LAN-LINK can also be configured for telemetry reception so as to capture-to-disk any packets addressed to or from the SAREX callsign. The capture-to-disk file is opened by a packet header containing the SAREX call, WA4SIR-1, and closed by another packet header not containing that call. Packet headers are considered to be lines with a ">" character in them. LAN-LINK thus considers both of the lines below as packet headers.

N4QQ* >G3ZCZ
N4QQ BBS>

LAN-LINK users may also set up these features for copying telemetry from the Microsats.

Another smart program of particular interest to Microsat users is a program called WHATS-UP. The documentation file is, of course, called WHATS-UP.DOC. This program takes transmissions from the Microsats and displays the decoded telemetry in real-time. It can also use previously stored data to display the telemetry in a playback mode.

LAN-LINK and WHATS-UP are available for $35 each from *Joe Kasser G3ZCZ, PO Box 3419, Silver Spring MD 20918.*

Chess, Anyone?

Whether you are a Grand Master or an occasional player, you will enjoy Packet Chess 1.0. Packet Chess runs on an IBM PC or compatible with an EGA or VGA card. An AMIGA version is also available.

Packet Chess starts in a terminal mode which allows you to set up communications with your TNC and establish a connect with your opponent. To start the game, you hit the ESC key, which displays the high resolution color chessboard on your CRT. The player who hits the ENTER key first will play the white pieces and make the first move. This causes the black side to appear on the opponent's screen.

Pieces are moved by placing a white box around them using the cursor keys. Illegal moves are not allowed, as well as moves putting yourself into check. After you move a piece, the information is relayed via packet to your opponent, and the piece is moved on his screen. You can't move a piece unless it's your turn.

There is a window area below the chessboard for messages. This will tell you if it's your move or whether you're in check. It can also be used to display messages from your opponent. To the left of the chessboard is a menu area describing function key commands. By hitting function key F1, you can send comments to your opponent such as: "Your move, if you DARE!!" This is a great way to give you that psychological advantage.

Other function keys allow you several options, such as adding or deleting pieces, or changing sides. You can save an existing game to play at a later date as well.

Packet Chess 1.0 is available for $29 from the *Great Circle Map Co., PO Box 691401, San Antonio, TX 78269.*

Dx

Number 19 on your Feedback card

Hams Around the World

Bob Winn W5KNE
c/o QRZ DX
P.O. Box 832205
Richardson TX 75083

DXing Tools and Aids

You can work some DX and slowly increase your DX country count by just getting on the air and randomly tuning the bands, but by becoming an informed DXer you'll gain experience and a higher country total a lot faster.

Becoming an experienced and knowledgeable DXer doesn't happen overnight. It helps to learn good DXing tools.

DX Techniques

Last month's discussion of pile-up techniques just barely scratched the surface. The technique described is of prime importance. There are more techniques that will make DXing easier and reduce your level of frustration while you add more country notches to your gun. Several books currently in print discuss DX operating techniques. My favorite is *The Complete DX'er* by Bob Locher W9KNI. Bob presents the techniques of DXing in a narrative style that is informative and enjoyable. (Order from your favorite dealer or direct from Idiom Press, P.O. Box 583, Deerfield IL 60015.)

DX Nets

Have you ever wondered about the frequency and time of operation of "Snooky's Net," or when the "14222 Net" is active? If so, then Dieter OE2DYL can help you. The 1990 edition of *DX-Nets Around the World* compiled by OE2DYL contains information about more than 100 active DX nets. To order *DX-Nets* send US$3 or 9 IRCs plus a self-addressed envelope (SAE) to Dieter Konrad OE2DYL, Rosengasse 1, A-5050 Salzburg, Austria.

QSL Routes

QSL routes are listed by all DX bulletins, but there are several publications that specialize. Addresses of three such publications were listed in my March 1990 column.

DX Bulletins

DX bulletins provide valuable information about DXpeditions, new countries and prefixes, QSL routes, where and when the "rare ones" are operating, and much much more. The most popular weekly DX publications are listed below with the editor's callsign in parentheses. All but *Les Nouvelles DX* are written in English. *DX News Sheet* (G4DYO), Radio Society of Great Britain, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE, England. *Inside DX* (N2AU), 436 N. Geneva St., Ithaca NY 14850. *DX-press* (PA3CXC), c/o VERON, P.O. Box 1166, 6801 BD Arnhem, Netherlands. *The DX Bulletin* (VP2ML), P.O. Box 50, Fulton CA 95439. *QRZ DX* (W5KNE), P.O. Box 832205, Richardson, TX 75083. *Les Nouvelles DX* (F6AJA), 515 rue du Petit Hem, F-59870 Bouvignies, France.

Country, Prefix, Zone Lists

For the new and born again DXer the addition of new countries, the proliferation of special prefixes and new ITU callsign allocations can be confusing. It is confusing even to some experienced DXers! However, there are several publications available that can help to bring order to the confusion. The "official" list of DX countries, on which most DX awards programs are based, is *The ARRL DXCC Countries List*. Included with the list of DXCC countries are the rules for the DXCC awards, DXCC countries list criteria, a check list for the DXCC awards, and more. The list is available for $1.00 from The ARRL, 225 Main Street, Newington CT 06111.

One of the finest DX aids available anywhere is The 15-page *DXNS Radio Amateur Prefix-Country-Zone List*. This list is one of several DX-related publications compiled and published by Geoff Watts, former editor of the RSGB's *DX News Sheet* (1962-1982). According to Geoff's description, this list, arranged in order by prefix, puts all information for each country on one line: normal prefix, special prefixes, ITU callsign block, continent, DXCC status, CO and ITU zones. In addition, the list contains information about obsolete prefixes used during the past 10 years, Antarctic stations, DXCC notes, etc. Order from Geoff Watts, 62 Belmore Road, Norwich, NR7 OPU, England. Cost: US$3.00 or 6 IRCs for the double-sided version; US$4.00 or 8 IRCs for the single-sided version. I heartily recommend this publication. My copy is ragged and worn from heavy use.

Also available from Geoff Watts is the 14-page *DXNS DXCC Countries Guide* which lists present and past prefixes back to 1945, previous names of countries and other useful notes. The price is the same as listed above.

Awards Directories

Chasing DX and working new countries is a fine hobby, but simply working new countries and collecting QSLs from around the world is not enough—the name of the game is AWARDS. In addition to the popular DX awards such as DXCC, WAZ, WPX, etc., many other attractive awards are available. If you are interested in collecting "wallpaper" then you should consider acquiring one or more awards directories. I am aware of two awards directories currently being published: *The K1BV DX Awards Directory* and *The International Awards Guide Book* compiled by YBØWR.

The 1989 edition of *The K1BV DX Awards Directory* contains details of more than 1,000 awards from 100 countries plus suggestions for earning and applying for awards, etc. The 1989 edition contains 170 loose-leaf pages and is available for $15.50 postpaid in the US, US$15.00 overseas by surface mail or US$19.00 overseas by airmail. Order from Ted Melinosky K1BV, DX Awards Directory, 525 Foster Street, Suite 1001, South Windsor CT 06074.

The International Awards Directory by YBØWR is a bound book (422 pages) which lists more than 750 awards, 634 of which are in actual color. If you are not already hooked on awards, just looking at some of the beautiful awards in YBØWR's book will certainly get your attention. Order from M. S. Lumbangaol YBØWR, Jl. Garuda No. 62, Jakarta 10620, Indonesia. The cost is US$37.00 (surface mail).

In next month's column I'll discuss prefixes—new, old and special. Plus, how to understand Soviet callsigns.

Number 20 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the June issue, we should receive it by March 31. Provide a clear, concise summary of the essential details about your Special Event.

MAY 4-6

SIERRA VISTA AZ The Cochise ARA will hold its annual Hamfest at the club training facility. All ham radio, computer and related businesses are invited to attend. No charge for tailgeters. VE Exams. Overnight RV camping (no hookups) available to club members. Talk-in on 146.52 or 146.76 (-.6). Handicap facilities available. Contact *Robert Hollister N7INK 602-378-3155 after 6 PM* or write to *CARA, PO Box 1855, Sierra Vista AZ 85636.*

MAY 5

MASSACHUSETTS QSO PARTY Sponsored by the Wellesley ARS from 0000Z Saturday-2359Z Sunday. 160-10 meters. CW and phone. No crossmode, crossband, packet or repeater contacts. Frequencies: CW 15 kHz up from the bottom of the General bands. SSB 25 kHz up from the bottom of the General phone bands. Novice and Technician CW and SSB bands. Exchange RST and OTH (county for MA stations) state, province, or DX country for others. Work stations once per band and mode. MA to MA contacts allowed. Points: 1 per phone contact, 2 per CW contact. Contacts with club station W1TKZ count 5 points. MA stations multiply total QSO points by number of states, etc., and MA counties worked for final score. Others multiply total QSO points by number of MA counties (max 14) worked. Certificates awarded. Mail logs by 6 June to *Wellesley ARS, MA QSO Party, 211 Washington St., Wellesley MA 02181.*

BEMIDJI MN The Paul Bunyan ARC will hold its annual Hamfest at the V.F.W. Club from 8 AM-3:30 PM. Dealers, exams and flea market. Talk-in on 146.13/.73. Contact *Carol Johnson KA0AJD, 1503 Jefferson Ave. SW, Bemidji MN 56601 218-751-7920.*

CEDARBURG WI The Ozaukee Radio Club will hold its 12th annual Swapfest on Jct Highway 60 and I, 20 miles north of Milwaukee from 8 AM-1 PM. Exhibitor set-up at 7 AM. $3 per 4' table. Admission $3 at the door. Talk-in on 146.37/.97, 224.18/222.580 and 146.52. SASE to *ORC Swap, N5415 Crystal Springs, Fredonia WI 53021. 414-692-2329.*

OWEGO NY Southern Tier ARC will hold its Hamfest at the Marvin Park Fairgrounds from 8 AM-4 PM. Indoor and outdoor flea markets, VE exams. Admission $4 at gate; tailgate $6. Tables $15. 31st annual Banquet is $15 per person in advance, (includes general admission). Contact *STARC, PO Box 7082, Endicott NY 13760.*

DULUTH MN The Arrowhead RAC of the Duluth/Superior area proudly presents SWAPFEST '90, which will be held at the First United Methodist Church from 10 AM-3 PM. Admission $4. 4' tables $5. Talk-in on 146.34/.94. Contact *Duane Flynn KB0LC, 4907 Peabody Street, Duluth MN 55801 218-525-4580.* There will also be License Exams held at the Government Services Building. For pre-registration or info contact *John Crow KA/0SYN, 1365 Roland Road, Cloquet MN 55720. 218-879-5356.*

MAY 5-6

GREENVILLE SC The Blue Ridge ARS proudly sponsors the Greenville Hamfest and Electronic Flea Market at the American Legion Fairgrounds from 8 AM-5 PM Saturday; 8 AM-3 PM Sunday. Advance admission $4, $5 at the gate. For tickets and information send SASE to *Blue Ridge Amateur Radio Society, PO Box 6751, Greenville SC 29606.*

MAY 6

DALTON MA The NOBARC Mayflea will be held at the Dallon American Legion starting at dawn. Admission $1. XYLs, YLs and Kids free. Talk-in on 146.91. For info call *413-458-8452.*

MAY 12

MANITOWOC WI The Mancorad RC will sponsor their Hamfest at the Manitowoc county Expo Center from 8 AM-5 PM. Flea market, ham and computer equipment. VE exams. Camping available via *Manitowoc Co Expo Center, 414-683-4378.* Admission $2 in advance, $3 at the door. Tables: 8' $3, with electric outlet $5. Talk-in on 147.03/.63 or 146.01/.61. Send SASE to *Mancorad RC, PO Box 204, Manitowoc WI 54221-0204* or call *(days) "Red" 414-684-9097, (nights) "Lou" 414-682-2557.*

CLINTON IA The Clinton ARC will hold "Hamfest 90" at the Iowa National Guard Armory. There will be a limited outside area for trunk sales. Gate opens at 8 AM. Tickets are $3 advance, $4 at the gate. Tables $5. VE Exams. Talk-in on 145.43 repeater. Contact *Darryl Petersen KD0PY, R.R. #1 Box 84, Bryant IA 52727. 319-682-7359.*

JEFFERSON WI The Tri-County ARC will hold its annual Hamfest from 8 AM-2 PM at the Jefferson County Fairgrounds. This will be an indoor/outdoor event. Indoor space requires reservation ($3 per table). Advance admission is $2.50, $3 at the door. Free parking. Talk-in on the 144.89/145.49 repeater. Send an SASE to *TCARC, PO Box 112, Jefferson WI 53549.*

MAY 13

WESTMINSTER MD The 2nd annual Carroll County Computer Fest and HAMBOREE will be held at the Carroll County Agricultural Center, sponsored by Summit ARA. Doors open at 8 AM. Admission is $4. Handicap parking. Tailgating starts at 6 AM, $5. Inside tables $8, including electricity. Talk-in on 224.68, 224.64, 146.52. Contact *Al Parker KS3L, c/o SARA, PO Box 341, Randallstown MD 21133 or call 301-747-2076.*

ATHENS OH The Athens County ARA will hold its 11th annual Hamfest at the City Recreation Center from 8 AM-3 PM. Admission is $4, spouses of hams free. Outdoor space free for tailgaters. Indoor space available by advance only. Talk-in on 145.15/.55. Contact *John Biddle WD8JLM, 80 Wonder Hills Dr., Athens OH 45701. 614-594-8901.* Or write to *Carl J. Denbow KA8JXG, 63 Morris Ave., Athens OH 45701.*

MAY 14

BOULDER CO There will be a VE Team Test at the American Legion at 7 PM. Pre-registration preferred. Contact *Barbara McClune N0BWS, 303-530-1872.*

MAY 18-20

TULSA OK The 1990 Green Country Hamfest will be held at the Expo Square Pavillion. Advance admission is $5, $7 at the door. Tables are $4 in advance, $5 at the door. VE Exam pre-registration: *VE Exams Attn: KA5VIL Georgia, 5332 S. Irvington Ave., Tulsa OK 74135.* Pre-registration required for Saturday test. Send a form 610 with a check payable to ARRL-VEC for $4.95 and a copy of your license. We will not have a copy machine available at this site. Walk-ins permitted on Sunday. Exams are at 1 PM Saturday and 9:30 AM Sunday. Talk-in on 146.31/.91 (primary), 146.28/.88 (secondary). Open autopatch on 88 during Hamfest. Hamfest registration: *Green Country Hamfest 1990, PO Box 4283, Tulsa OK 74149-0283. 918-272-3081.*

MAY 19

MAYODAN NC The Snake Mountain Radio Assoc. will sponsor the 2nd annual Snake Mountain Hospitality Bash from 8 AM-4 PM at Farris Memorial Park. Free tailgating. Prize tickets $2. Tables $4. Talk-in on 147.390. Write with SASE to *Jim Phillips AA4QT, PO Box 648, Ridgeway VA 24148.*

EPHRATA PA Lancaster County Hamfest, sponsored by the Ephrata Area Repeater Society, Inc., will be held at the Ephrata Senior High School. Set-up at 6:30 AM. General admission at 8 AM. Handicap accessible. Amateur Exams from 9 AM. Entrance fee $4, tailgating $3, inside tables $6. Talk-in on 145.45, 146.52 and 444.65. Call *Tom Youngberg K3RZF at 215-267-2514 after 6 PM* or write *E.A.R.S., 906 Clearview Ave., Ephrata PA 17522.*

SPRINGDALE AR Hamfest 90, sponsored by the Northwest Arkansas ARC, will be held at the Community Building at the Rodeo Grounds located at East Emma. Doors open from 8 AM-4 PM. Free admission. Tables are $5 each. Advance table registration is a must. Tailgating is $4 per vehicle. Free parking. Talk-in on 146.76 (-.600). Contact *Mike Lorenz N8FJJ, Rt 2 Box 160A, Prairie Grove AR 72753. (501) 846-2516 evenings. Via packet, N8FJJ @ KA5BML.AR.USA.*

CADILLAC MI The annual Swap and Shop sponsored by the Wexaukee ARA will be held at the Cadillac Middle School from 8:30 AM-2:30 PM. Admission $3. Tables $6. Talk-in on 146.38/.98 repeater. Contact *John Craddock KX8Z, 616-797-5491* or write *Wexaukee ARA, PO Box 163, Cadillac MI 49601.*

COLORADO SPRINGS CO Pikes Peak Radio Amateur Association will hold its Swapfest at the Rustic Hills Mall. No entry fee. Wheelchair accessible. Tables $10 advance, $12 at the door. Contact *Rick WB7THT, 719-599-7665,* or write *PO Box 16521, Colorado Springs CO 80935.*

MAY 19-20

YAKIMA WA The Yakima ARC, W7AQ, is celebrating its 60th anniversary at the Queen Gym, Saturday from 9 AM-4 PM, Sunday 9 AM-1 PM. Features: Visiting Soviet Amateurs, Swap n Shop, VE Exams, Banquet & program, and consignment table. Advance Admission $5, $6 at the door. Tables $7 each. Talk-in on 146.06/.66. Contact *Yakima ARC W7AO, PO Box 9211, Yakima WA 98909. Mary Wildman KB7AMF, 509-248-5007.*

HARTWELL GA Anderson, Hartwell and Toccoa A.R.C. will sponsor a Hamfest at the Lake Hartwell Group Campground from 7 AM-4 PM Saturday, 7 AM-2 PM Sunday. Talk-in on 147.330/.930-146.715/.115. Contact *B.J. Taylor WD4CUK, Rte 5 Senic Drive, Toccoa GA 30577; Carl Davis KY4T, College Ave., Hartwell GA 30643; Jones Beasley N4VNJ, Rte 2 Box 21, Lavonia GA 30553.*

MAY 20

OLD WESTBURY NY The Long Island Mobile ARC will hold a Hamfest at the New York Institute of Technology from 9 AM-4 PM. No advance, $5 at the gate. Exhibitors $8. Talk-in on 146.25/.85. Contact *Neil Hartman WE2V, (516) 462-5549 or Mark Nadel NK2T, 516-796-2366.*

PARAMUS NJ The Bergen ARA will sponsor a Hamfest at Bergen Community College from 8 AM-2 PM. Unlimited free close-by parking. VE Exams. Sellers $5 per slot, unlimited space available. Buyers admitted free. Talk-in on W2AKR 146.790. Contact *Jim Joyce K2ZO, 288 Ridgewood Blvd. North, Westwood NJ 07675. 201-664-6725.* For VE testing contact *Pete Adely K2MHP, 13-30 Edward St., Fair Lawn NJ 07410 201-796-6622.*

PEOTONE IL The annual Hamfest sponsored by the Kankakee Area Radio Society will be held at the Will County Fairgrounds from 8 AM-2 PM. Indoor exhibits, outdoor flea market. Free parking. Set-up 6 AM-8 AM. Overnight RV parking, no hookups. Admission $2.50 advance, $3 at the door. Talk-in on 146.34/.94. Contact *KARS c/o Frank DalCanton KA9PWW, R.R. #1 Box 361, Chebanse IL 60922. 815-937-2452 before 4 PM CST or 815-932-6703 after 4 PM CST.*

WRIGHTSTOWN PA The Warminster ARC will sponsor its 16th annual Hamfest at the Middletown Grange Fair Grounds beginning at 7 AM. Set-up at 6 AM. Admission is $4 per person (XYLs and children free). Free parking. Talk-in on 147.69/.09 repeater, 223.76/222.16 repeater, 52.04/53.04 repeater or 146.52 simplex. For pre-registration and info contact *Bill Cusick W3GJC, 215-441-8048.*

MAY 26

DURHAM NC The Durham FM Association will hold its 16th annual "DUR-HAM-FEST" under the South parking deck of the South Square Mall shopping center. Handicap accessible. Limited AC power available for dealer requirements and equipment testing. Advance tickets are $4, $5 at the door. Talk-in on the WA4WTX/ 147.825/225 repeater. For tickets, send SASE and payment to *R.P. Buehlmann N4IOA, 1314 Chaney Rd., Raleigh NC 27606. Tables $6. Inquiries, reservations, may be directed to* E.R. Lappi WD4LOO, 203 Lynn Dr., Carrboro NC 27510, days at 919-541-7688, evenings before 9:15 PM at 919-942-4076. For general info contact *Sid Edwards W4QWM, 1700 High St., Durham NC 27712.* For FCC Exam info, contact *Pete Goolsby KY4Y, 120 Radcliff Circle, Durham NC 27713.*

MAY 27

CHICAGO IL Chicago ARC will hold its annual Hamfest and Auction at De Vry Institute of Technology. Free parking. For details and reservations call *312-545-3622.*

WEST FRIENDSHIP MD The Maryland FM Association, Inc. will hold its annual Memorial Day Hamfest at the Howard County Fairgrounds from 8 AM-3 PM. Talk-in on WA3DZD/Repeater (146.16/146.76, 223.16/224.76 and 449.0/444.0). Premises MUST be cleared by 5 PM. Donation $4. Tailgating $3. Inside table rentals, advance $10, $15 at the gate (if available). Only PAID table reservations accepted. Make checks payable to MFMA, Inc. For reservations contact *Melvin Seyle WA3KZR, 15809 Pointer Ridge Dr., Bowie MD 20716. 301-249-6147.* Commercial vendors must have proper tax/license certificates available.

QUEBEC The Quebec Provincial Hamfest will be held at the Tracy Curling Club. Admission $5. Outdoor table $8, indoor table $10. Limited quantity, please reserve before May 15th. Open at 0900 (0700 exhibitors). Contact *Sorel-Tracy ARC, PO Box 533, Sorel Q.C. J3P 5N6 Canada.*

SPECIAL EVENT STATIONS

MAY 5

USS OLYMPIA The Olympia RAC will operate WA3BAT on board Admiral Dewey's flagship the *USS Olympia* from 1400Z-2000Z, to commemorate the 92nd anniversary of Adm. Deweys' triumph over the Spanish Fleet at the Battle of Manila Bay during the Spanish-American War. Frequencies: (±5 kHz QRM) CW: 7133, 21133 and 28133. Phone: 3865, 7245, 14255, 21355, 28355 and 145.27 MHz FM. RTTY on 20 and 10 meters. For certificate, send QSL and 9x12 SASE with 3 units of postage/IRCs to *Olympia RAC, PO Box 928, Philadelphia PA 19105.*

MAY 5-6

MUSKEGO WI The W/K ARC will operate station AE9K from the Nichols Astronomical Observatory, from 1400Z Saturday-0500Z Sunday to commemorate National Astronomy Day. Frequencies: 14.250, 21.350, and 28.450 MHz. Also look for AE9K on RS10 in the CW mode. For special OSL send an SASE to *Nichols Observatory, 3885 Pioneer Rd., Richfield WI 53076.* SWL reports are welcome and qualify for the special OSL.

COLUMBIA SC The Columbia ARC will operate N4QWL from 1500Z Saturday-2100Z Sunday, from the South Carolina State Capital Grounds in conjunction with the Annual Mayfest Celebration. Frequencies: SSB 28.400, 21.400, 14.250, 7.200 MHz and CW 28.200, 21.040, 14.040, 7.040 MHz. QSL with SASE to *CARC Mayfest, PO Box 5802, Columbia SC 29250.*

TOWSON MD N3HFS will operate from 1500Z-2300Z Saturday, and from 1800Z-2300Z Sunday, to celebrate the 23rd annual Towsontown Spring Festival. Rain dates are May 12-13. Frequencies: 14.255, 21.355, 28.355, and 146.58 MHz phone, 10 and 15 meter Novice CW bands, 15 and 20 meter RTTY, and 145.030 packet. For QSL, send your OSL and SASE to *305 Colonial Court, Towson MD 21204.*

MAY 6

NEVADA The Nevada QSO Party, sponsored by the Frontier ARS, will be held 0000Z Saturday-0600Z Sunday. Work stations once per band per mode. Exchange RST and state/province/country. (County for Nevada stations.) Frequencies: 6 meters-160 meters. Modes: CW, SSB, RTTY, SSTV and packet. Scoring: 1 pt. phone QSO; 2 pts. QSO other modes. Multiply by number of states/provinces/countries (Nevada multiply by counties). Certificates awarded to top score each state/province/DXCC country, General and above/Novice/Tech. mail entry by June 1, 1990 to *Jim Frye NW7O, 4120 Oakhill Ave., Las Vegas NV 89121.*

MAY 10

PROMONTORY UT The Ogden ARC will operate WJ7H from Promontory Summit to commemorate the 121st year of the driving of the Golden Spike. Operation time from 0001Z-2100Z. Frenquencies: 3.970, 7.270, 14.280, 21.375, 28.415. Send QSL and SASE to *Ogden ARC, PO Box 3353, Ogden UT 84409.*

MAY 11-13

ESCONDIDO CA In conjunction with the Annual Avocado Festival, the Escondido ARS will operate special event station WA6YOO on the festival grounds from 0000Z May 11-2400Z May 13. SSB operation at 3950, 7250, 21350 and 28450 kHz. CW operation will be 50 kHz up from the band edges. For an unfolded commemorative certificate, send OSL and large SASE (2 units of postage) to *E.A.R.S., 2435 Our Country Road, Escondido CA 92025.*

MAY 19

WASHINGTON DC The Pentagon ARC will operate K4AF in celebration of Armed Forces Day. Frequencies: Phone-7.235, 14.235; CW-7.035, 14.035. For QSL, send QSL and SASE to *PARC, PO Box 47063, Washington DC 20050.* Please include $1 if you want an 8x10 certificate.

PASADENA MD The Bay Area ARS will operate Station KM3I to commemorate the 146th anniversary of the telegraph message "What Hath God Wrought?", transmitted on an experimental line from Washington DC to Baltimore MD. CW frequencies (MHz): 7.110, 14.035, 21.110, 28.110. For commemorative certificate send your QSL card (SWL listeners send details of a QSO) along with a large (8½ x 11) SASE to *The Bay Area Amateur Radio Society, PO Box 805, Pasadena MD 21122-0805.*

Number 32 on your Feedback card

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS. (1200 baud, 8 data bits, no parity, 1 stop bit. (603) 525-4438). Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters 1 or i, or even the number 7. Thank you for your cooperation.

I need programming information on a Pace Landmaster II UHF mobile. If anyone has a service manual, please call me at (213) 926-2227 or leave a note for me. I will pay for postage, phone call, etc. Thank you. *Greg Fox N6QKR, PO Box 5824, Fullerton CA 92635.*

I would like to make contact with anyone that uses a Zenith Z170 computer for ham use. *Msg. Skip Barley, HHC, 26th Signal Bn., Box 561, APO NY 09178.*

Need info on substituting tubes for original 7094s in Hallicrafters HT 41. *S. Kiraly WA2O, 51 Ramon Blvd., Freehold NJ 07728. (201) 462-2705.*

I need the owners manual and schematics for the Allied AX-190. I will pay copying and shipping costs. Also want info on any ham software or ideas for new stuff for the Macintosh. Thank you. *Kevin der Kinderen KJ4QF, USAFS Sinop, PO Box 372, APO NY 09133.*

Wanted: Schematic diagram with or without manual for the Knight sine/square wave Generator Model KG-688. Will pay costs. *Harry Greulich WA6IWZ, 442 S. Alpine Rd., Orange CA 92668.*

Needed: Manual & schematic for Hewlett-Packard Model 608E Signal Generator. Will pay postage & copying costs. *Mike Colburn, 1422 Evenview Rd., San Diego CA 92110-1527.*

Wanted: Ur lix for rapid aging of Kenwood TS-6805 transceivers. *Lin Hamilton NJ6Y, 1150 Capitol Drive #84, San Pedro CA 90732.*

Wanted: Manuals for Kenwood TR-7600 and A76 memory/scan add-on. Bought used, but no manuals available, and some options are not easily deduced. *John Clark, 1807 Fornfelt St., Scott City MO 63780 (314) 264-2791.*

I am looking for help finding a manual and schematic for the Ham Keyer, Model HK5A. I am willing to pay a reasonable price and shipping costs. *Hank Ollis, 1212 Laurel Ave., St. Paul MN 55104.*

Need a schematic for the Regency Model BTL-301 high band VHF commercial transceiver. Will pay costs. Thanks. *Bill Graham N5LMX, 9704 164th Street East, Puyallup WA 98373.*

Need a copy of the schematic (only) for a Heathkit SG8 Signal Generator. All replies acknowledged. Thanks! *Greg Magarie WA1VIL, 33 Barnesdale Rd., Natick MA 01760.*

If anyone has info regarding UHF band modifications for the FT-470 HT for the 470 MHz band, please leave E-Mail on the 73 BBS for *Efrain.*

I would like to hear from any ham who has a DJ2UT-Multiband Beam by Sommer. I am having VSWR problems on the 17 and 30 Meter bands. Thank you. *Dale McMindes EL2DC/KA4HBW, American Embassy-VOA, APO New York 09155.*

Does anyone have a manual for the Tempo One HF transceiver? I will pay copying charges. *Geoffrey Deasey, 19 Maple Ave., PO Box 476, Madison NJ 07940 (201) 379-7400.*

NEEDED: Papers and technical programs for presentation at the Central States VHF Society conference in July. Contact *Jon Jones NO0Y, 1116 Gatewood Ct., Wichita KS 67206 or John Lock KF0M, 1427 S. St. Clair, Wichita KS 67213.*

Number 21 on your Feedback card

QRP

Low Power Operation

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

Change of Scene

Every now and then I like to set up and operate my HW-8 from the back yard. I know it's not exactly a DX site, but it does change the surroundings a bit.

So here I go. I carry up the HW-8, battery, solar panel, log book, SWR meter, keyer and keyer paddles. My goodness, that's a lot of junk! What in the world would I do if I needed to do this in a hurry? The idea would be to eliminate some of the odds and ends.

To shave off some of the extras, I could use my Argonaut and keep the SWR meter in the shack. The Argonaut has an SWR meter built in.

Of course, we need a power supply. An 8-amp gel/cell works just fine. No worry about acid spills with the sealed battery.

A Solarex MSX-10 will supply 10 watts of solar power to keep the battery charged, or it can run the radio directly if need be.

Got to keep the log book. Just in case.

Sure need the keyer. Can't see myself running CW *during a* disaster with a Navy J-48 straight key! And of course, a set of paddles. Now, here is trouble. How or what does one do for paddles? I guess you could say you're up the creek without a paddle.

Mobile CW

If you've ever worked CW mobile before, I'm sure you've worried about this one. There is no single correct answer. I have worked on the problem and come up with these ideas. Ideally, the keyer and the paddles should be housed within the same box. This way you only have to carry one box instead of two. Of course, the unit should be able to stand up to the rigors of mobile/portable use.

I've *seen* several designs using micro-switches. These seem to work, but you can't adjust a micro-switch. It is either on or off. In other words, there is no feel to the paddle.

My first attempt at fixing the problem was to use a commercial product. My victim turned out to be an old Ten-Tec K-5 single paddle keyer, which I picked up at a hamfest.

There was a lot of wear and tear on this unit. In fact, when I powered it up, the poor thing would start sending CQ DX! Looking over the keyer revealed a very badly worn paddle assembly. A quick call to Ten-Tec had two new paddle assemblies on their way. One for the repair, the other for stock.

While I was waiting for the parts to arrive, I tried using the K-5. Try as I might, I was less than impressed with the results. Most of the keyers I use at my shack have dot/dash memory. In other words, you make a dash and then a dot, and while the keyer is generating the dash, it will remember you want a dot next. After the dash is complete, the keyer will send the dot. The K-5 will not do this. I kept sending CW with a missing dot *or two, or three or four.*

I fixed the problem by first tearing the circuit board out of the K-5. Easy fix. In its place I installed a small CMOS keyer from an old *QST* article. Although the circuit uses several CMOS chips, the results are very good. Self-completing dots and dashes, and dot-and-dash memory. I modified the circuit for 12-volt operation and added a small reed relay for transmitter keying.

If you wanted to, you could use a Curtis keyer on a chip. I didn't have one handy. I just used what was lying on my workbench.

While I had the case torn apart, I added a three-circuit jack on the back panel. This will allow me to add an external paddle set if I want to.

When the circuit board was stuffed, I installed the new paddle assembly part along with the keyer board. The results were much better. Even though the keyer circuit I used is capable of iambic keying, the use of a single paddle rules this feature out.

Now the re-fitted K-5 is much more to my liking. I can pack it along with the rest of the gear. Even if the paddles are not state-of-the-art, they do work quite well.

I was still not a happy camper. Not yet. I was planning to use the portable keyer with a home-brew rig. So what's the big deal? The K-5 was bigger than the rig! I needed a small hand-held keyer—with a built-in paddle.

Cutting it Down to Size

After many hours of tinkering, I have to say this keyer is less than perfect. In fact, the key paddle is worse than the worn out assembly part from the K-5! However, the result is a small, hand-held unit that works just fine.

The following is not a step-by-step list of instructions. The user will have to build his/her own version. Most of the parts came from my junk box and the local hobby store. The paddles are guitar picks.

I had no idea just how many different types of guitar picks are made. And when I went to the music store, how was I going to explain what I was going to use them for? So I told the guy behind the desk I used to play back-up guitar for Jimi Hendrix, and I was going to get back into the music scene. He laughed so hard he gave me my choice of picks for ten cents each!

Having the paddles, all I needed now was a set of contacts and a moving bar to make and break on those contacts. Here is what I came up with.

Making the Contacts

First I cut a small block of plastic down the middle, about three-quarters of the way though. Then I went to the hobby store for some brass strips 4" x ¼". Determine thickness of the strips according to how much give you want. Also, the longer the strip, the more spring it will have.

About an inch is held in the plastic block, two 6-32 screws keeping the block and brass strip together. For the ground connection, I added a solder lug. The brass strip is the moving ground for the keyer. The block is supported ¼" above the bottom of the chassis.

The hardest part was coming up with the contacts. What I did was take a set of bakelite contacts from an old relay. One set of contacts were cut from the main body of the relay and glued to a piece of plastic channel using epoxy. By leaving the solder taps on, I had an easy place to solder the dot and dash wires from the keyer.

Setting the contacts was fairly routine. Using small needle-nosed pliers, I bent the contacts to suit myself. Since the brass strip can move the contacts if pushed too hard in either way, the paddle travel is determined by the front panel. The hole in the brass strips, though, is the slop. By making the hole larger, you'll increase paddle travel. It's really a cut-and-try method of building!

After you're happy with what you've made so far, all you have to do is glue the guitar picks onto the brass strip. I use super glue and it seems to work, if you pardon the pun, just super!

The electronics used for the keyer are a bit strange. After all the belly-aching about the K-5 and its circuit, I ended up using something very much like it.

In fact, I use the DYI keyer from the July 1988 QRP column in *73 Magzine*. As I said in the original article, all this thing does is make dots and dashes. Nothing more.

Some good news. Thanks again for people like Tom Berryhill ABØQ, who supplied the printed circuit boards for the DYI keyer. There are few hams in Tom's class. I'm truly proud to know him.

Since the DYI keyer can operate from a wide range of voltages, I didn't want to mess with a 9-volt battery inside the keyer. I get operating power from the host radio via a three-wire cable. This cable also supplies the host with the keyer's output. So with three wires I get the following: ground, +12 for keyer, and keyer output for radio. This cable is hard-wired to the keyer. A three-terminal, ¼" plug terminates the other end.

A strip of double-sided tape holds the circuit board in the case. Nothing fancy, but it works.

I just could not hold back when I was putting all this together. I added a simple tune button from Ten-Tec on the top of the keyer. Ten-Tec uses the very same thing on their keyers. A set of small stick-on feet finishes off the keyer.

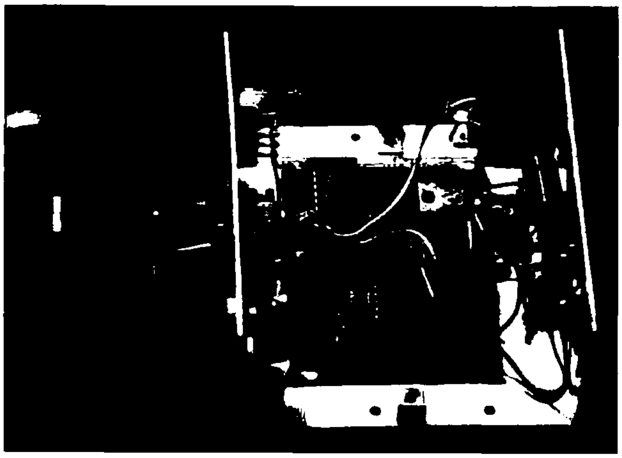


Photo A. The modified Ten-Tec K-5 keyer.

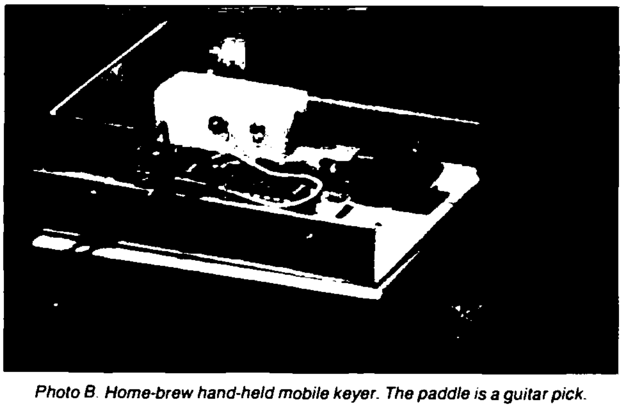


Photo B. Home-brew hand-held mobile keyer. The paddle is a guitar pick.

Kits Available

So how does it work? Well, not too bad. Nothing to really get excited about, but it sure beats using micro-switches for a paddle. The whole thing is about the size of a pack of cigarettes. Why, who knows? This might be my gateway to 50 wpm, portable.

If you're interested in building a DYI keyer, I have had some more kits made up, $12 postpaid. These kits have just about everything you need to build the basic keyer. You'll have to supply the metal parts. Hurry, since I don't have too many of them.

One last thing before we go. June is Field Day. How about some good photographs of your Field Day? Let the *other guys shake in their boots when* they see your set-up. 73

Never Say Die

Continued from p. 4

music goes. I love music and want to do what I can to get you to share the things I enjoy. So check it out. Music/NH is a way for you to find those hard-to-find CDs produced by independent record entrepreneurs.

At this writing Scott Kirby is again visiting at my farm, laying down tracks for a second Scott Joplin CD. Knud Keller KV4GG is here almost daily, attending to the two 1890s pianos Scott is using. And I'm in almost constant bliss, listening to Joplin's incredible music night and day . . . played by the best ragtime pianist I've ever heard.

If you can get to New Orleans, watch for Scott and his piano playing ragtime on the street. Tip him generously . . . it's his main source of livelihood. If you get to Mobile, don't miss my old home during WWII, the Drum SS228.

Why You Should Travel

Can I get you out of your rut? Is it possible for me to change your life . . . for the better? I'm going to give it a try.

A letter from W4UW reminded me that many years ago I wrote an editorial pointing out that travel really isn't very expensive . . . and that the money you spend on travel will bring you more value in your life than any other comparable investment.

For most of us it isn't the expense of travel that stops us . . . because it really doesn't have to cost all that much. You don't think much these days of buying a new TV set or VCR.

Sherry and I just returned from a fantastic trip to Europe. The flight cost only $300 round trip. Sure, you have to watch for travel bargains like that, but if I can find 'em, so can you. During the eight days our hotels averaged about $90 a night . . . which included excellent buffet breakfasts. We packed away enough at breakfast so we seldom needed more than one other meal a day . . . and those were often under $10 for the two of us. Sometimes way under.

I used to talk a dozen or so hams into going with me to Asia every October to see the electronic shows in Japan, Korea, Taiwan and Hong Kong. The trip, including first class hotels, all travel, huge breakfasts and banquet dinners in each city, cost about $1,500 for two weeks. No one who went on those trips will ever forget any part of them.

No, it isn't the cost which is keeping you from seeing the world . . . keeping you from visiting Swaziland or Lesotho and getting on the air for some unforgettable DXing . . . it's more you're inability to actually make up your mind to do things. I DO things.

I have priceless memories of DXing from Navassa, Kuching, Kota Kinabalu, Aden, Damascus and Katmandu. I wouldn't trade those memories for anything.

So where have you been going on vacation? Florida? Disney World? It wouldn't cost you much more to visit Budapest and meet the friendly hams there. Or Stockholm. Or Mariehamn, up in the Aland Islands (OH0).

For just a few hundred dollars extra, Sherry and I extended one Asian electronics tour to include Bangkok, Singapore, Brunei, Sabah, Sarawak and the Philippines. The hams in these countries helped make our visits to these strange places unforgettable.

No, it isn't the money that stops most people from going on DXpeditions or even just plain traveling. It isn't the time away from work. It's inertia.

Heck, if you work any DX at all you're up to here in offers to visit when you're in the area. Twenty years ago there was a Ham Hop Club which helped arrange ham visits in dozens of countries. If anyone is interested in getting something like this going again, I'll be glad to help. No, I'm not (for once) going to do it myself. I'd rather spend the time it would take to organize and run a ham travel club going on a few more DXpeditionettes.

Eastern Europe is in a turmoil and one of the benefits to us is that for the first time in years the hams in these countries can safely talk on the air with us. We can visit these countries for peanuts and get to know their hams. It's no longer difficult to get a license and sit down for a few days of DXing using a borrowed station.

It's much easier to use a station that's already there than to cart one halfway around the world. You see, 99% of the hams in rare countries are delighted if you'll work the pileups for a few days for them . . . and take care of those confounded QSLs. It just isn't any fun for someone in Sarawak to be constantly faced with thousands of DXCC fanatics who refuse to permit them anything more than a signal report and want nothing more than a QSL card. Working endless hundreds of DXers who obviously could care less about you as a person isn't much fun. That gets old quickly. The DXCC award pressure helps keep these countries rare and discourages new hams.

So I've had great fun operating from fairly rare spots such as Jordan, New Caledonia, Western Samoa, Fiji, Wake Island, Bangkok, Katmandu, Damascus, Kenya, Aden, Afghanistan, Iran, Tahiti, Haiti, Bermuda, Aland, Lebanon, Lesotho, Swaziland . . . and many others. And all this while you were sitting there watching ballgames and *Dallas* on TV.

Oh, I've watched ballgames on TV too, but they weren't as memorable as my trips. I seem to remember watching the World Series once . . . the Brooklyn Dodgers vs. the Giants, I think it was . . . or maybe the Yankees. It was a while ago. and the last baseball I've watched. I guess I prefer doing things to being a couch potato and watching others. Zooming down the slopes beats the heck out of watching skiers on TV. No video of scuba diving even comes close to the excitement of the real thing.

You'll find the hams around the world eager to meet you and talk. If you start spending your vacations visiting rare countries and activating 'em, you'll have articles to write for *73*, pictures to show your club and at ham-

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fests, and you'll have a new bunch of friends to talk with on the air . . . friends you know personally.

TWA has an el cheapo flight to London over the Thanksgiving weekend. For around $600 each, Sherry and I went to London last November . . . and that included a Hilton hotel with big breakfasts, two shows and a car for the week.

You just have to keep your eyes open and grab the chances when they pop up. There was a bargain skiing trip to Italy in February, but I was busy with my visit to Poland and Czechoslovakia, so I missed it. Aspen in January? You bet . . . that's the low season, oddly enough. And when you get together with a group of friends, it's surprisingly inexpensive. The skiing costs, but it's half price for old timers like me.

One of the best travel bargains I've found is the Eastern/Continental Airlines Get Up And Go Passport . . . for people over 62. You can use it once a week and go first class for a whole year for about $2,000.

If you come across any outstanding travel bargains, for Pete's sake drop me a line or a FAX. I don't want to miss out, if there's any chance for us getting away.

Poland—Up Close

Yep, while other ham magazine editors are bringing you exciting hamfest food reviews, your dedicated *73* correspondent has been visiting Poland and Czechoslovakia . . . talking with the hams to get their perspective on the recent incredible political events. The events in these countries are most important to amateur radio . . . and as it turns out, we here in America can do a lot to help our Eastern European fraternity members cope with the changes.

It all started five months ago when Hope Currier, one of our *73* editors, got wind of a special Lufthansa bargain . . . $300 round trip anywhere in Germany. Hmmm. Germany? $300? Let's take a look at the little old map of Europe and see where we're going.

The action looked to me as if it would be in Poland and Czechoslovakia, so the best starting point would be Munich. Yep, we'd rent a car, drive down to Vienna and then up to


Andrew SP9RPT with a surplus rig.


Henryk SP9JPA with W2NSD/1.


Jan SP9LLH with a Polish HT.

Krakow, over to Prague and back to Munich. That ought to do it.

I had too many other commitments to make the trip in October, November, December, January, March or April, so it had to be February. Yoiks, driving over a thousand miles in the dead of winter in the middle of Europe? I'd likely be up to my kazoo in snow. And the drive between some of those cities isn't easy either, even in good weather! Oh, well. I always seem to be able to blunder through somehow.

I asked Jim K6MH to get licenses for me for DL, OE, SP and OK . . . and to help set me up to meet the radio clubs. Despite the five month lead time, Jim was only able to get me a license in Germany!

To fit the trip in between my other travel commitments I had to limit it to ten days, maximum. That meant one day over, one day back, one day in each city and the best part of another day driving between the cities. In the snow, in all probablility.

Oddly enough, this trip was already scheduled when Sherry asked me to go to Munich with her on a weekend business trip in early November. That was when she wanted to get a video of people dancing the Lambada . . . the Brazilian dance which is sweeping America now.

It was tough taking time off from work to make this trip. I'd only been at home a week in January . . . just barely enough time to come up with four or five new business ventures and get them started. I keep thinking up more and more ways to help independent record companies sell music. I wish I had a dozen more entrepreneurially-inclined people working with me to speed up these new projects. It's frustrating to see so many things which should be done and to not be able to find enough enthusiastic people to tackle them. I've got my present team going crazy trying to keep up.

Now. The Trip. We started from Boston and flew to Frankfurt, leaving Sunday evening and arriving Monday morning. Then a short commuter flight to Munich. They have nice bag lunches for these flights which some American airlines would do well to check out. You grab a bag as you get on the flight. Sandwich, cake, candy, orange drink. Sure beats most hamfest food.

In Munich, Avis had an Audi 100 for us. We loaded our three suitcases and assorted hand luggage into it. Sherry takes her refrigerator-sized portable Mac everywhere with her. I always have at least two laptops with me . . . plus cameras. One suitcase was full of magazines for ham clubs.

We checked into our hotel, took a short nap and met with Helmut Schmucker DL5KW, who took us via the subway to a great Bavarian restaurant. Four other hams arrived and we had a great dinner and talked hamming until I couldn't stay awake any longer.

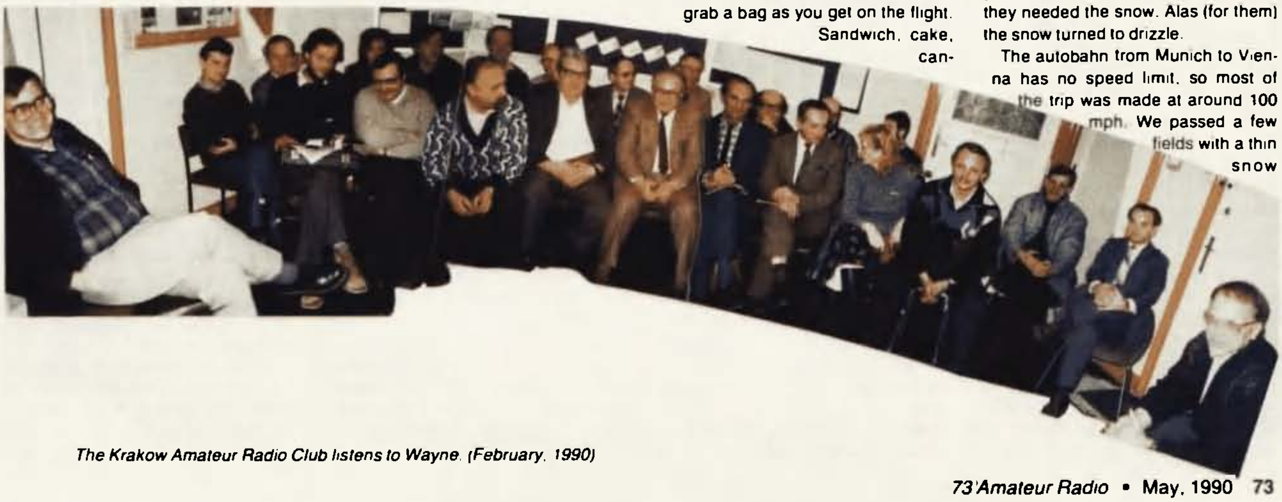
Helmut is an engineer working on the CERN Supercollider, so I had lots of questions for him. The group is finishing up work on a packet satellite and promised some articles on it for *73*.

The next morning a friend picked us up and drove us to visit the Pilz CD manufacturing plant on the outskirts of Munich. We talked over plans for making special CDs for some of my new projects.

That afternoon, Helmut took us by subway to the Deutsche Science Museum to see the special ham exhibit and station. When you get to Munich, don't miss it.

The next morning it was snowing . . . just what we needed to help our drive to Vienna. Europe was in the midst of the worst snow drought in years, with very little skiing possible, so they needed the snow. Alas (for them) the snow turned to drizzle.

The autobahn from Munich to Vienna has no speed limit, so most of the trip was made at around 100 mph. We passed a few fields with a thin snow


The Krakow Amateur Radio Club listens to Wayne. (February, 1990)

cover and could see some snow in the mountains, but that was about all. Even if I'd had time to ski, there wouldn't have been much available. I'm glad I took a week in January for our yearly ham ski trip to Aspen. When are you going get off your duff and join us zipping down the slopes, HT in hand?

My ham meeting in Vienna went awry with crossed signals, so I didn't meet the hams this time. I was disappointed to learn that my old friend OE1FF had passed away a couple years ago. I had enough other meetings to keep me busy . . . with a nice lunch at the Hotel Sacher while arranging to swap ham articles with an Italian ham magazine publisher . . . and coffee at the famous Cafe Mozart with a writer proposing some articles for *CD Review*.

Now the big deal . . . Poland. The idea was to drive across Czechoslovakia to Krakow. I had FAXes from the Krakow club saying they were waiting for me. I got a shock when I filled the gas tank in Vienna . . . $50! Gadzooks! I had to leave Sherry hostage and go back to the hotel and change dollars for more shillings. I never expected to pay $4 a gallon for gas.

Not knowing what the gas situation would be in Czechoslovakia, I topped off again when we reached the Czech border. That turned out to be a very, very good idea. There was such a long line waiting to get into the country, it took an hour to go one block. The border was right in the middle of a town!

The Austrians waved us through. The Czechs stamped in our two-day visas and then demanded that we buy $72 worth of their money. "Don't worry, you can use it to pay your hotel bill." Sure. Welcome to the Czechoslovakian Soviet Socialist Republic.

The roads weren't bad. Two lanes. I did have to pass a lot of lumbering trucks, but there were very few cars. By going 90 in the clear spots I managed to average about 45 mph. Here and there they had superhighways, but mostly it was country roads that went right through the middle of one small town after another. The really depressing thing was the air pollution in almost every city. Their cars, trucks and industries are terrible. How can they ever afford to clean up the mess?

The line at the Polish border was about the same as the Czech . . . took about an hour. No one at the border spoke a word of English. They took our passports, stamped them, passed them along to the next chap, more stamping. Finally they gave 'em back and waved us on. I got into the car and Sherry found they'd kept our two-day Czech visas. I rushed back to get 'em back so we could re-enter the country and drive to Prague. The whole place was deserted.

I finally found someone in charge and discovered that we were not going to get our visas back. El tough-o on the two days. Ditto our wishes to re-enter the country. Ditto our $72 worth of Czech paper. I'd have to get new visas from their consulate in Kadowice, Poland. Drat!

Oh well, Kadowice was only about 35 miles off our route to Krakow, so we headed there. We made it in less than an hour. The little dot on my map turned out to be a good-sized city. You don't know fun until you've tried to find a foreign consulate in the middle of a large city where no one speaks English. But, with the patience of the Poles, we found it on a back street. The sign on the door said visa hours were 8–12 Mon–Fri. It was now Friday at 3 p.m. This couldn't be happening.

I had appointments in Prague on Monday with the president of the radio club and with their state music company. I tried the intercom at the consulate gate. A nasty woman answered. She did not speak English, except for, "Monday, 8 a.m."

In my mind I ran through all the applicable curses I could think of. I thought of a wide assortment. Then, still grumbling at the CSSR and rotten communist bureaucrats, we drove on to Krakow. Our reception there made up for the frustrations with Czechoslovakia.

Yes, I suppose we should have known to get both transit visas and visiting visas, but it's been a long time since I've run into that baloney . . . and the Czech embassy didn't mention it when we applied.

The Krakow DXers club.

It only took three enquiries to find our Krakow hotel. I'm getting good at this stuff. A Holiday Inn, no less. Cheap, too! I sent FAXes to the Prague radio club, to the music group and to our embassy in Prague. You know, Shirley Temple Black. I got back fast FAXes from OK1BW and Supraphon . . . zilch from Shirley.

On Saturday the Krakow club met and I talked with them for several hours. They had about 40 hams present. The president, Henryk SP9JPA, is an interpreter by profession so I was in excellent hands.

Now, if you think you have problems finding parts, just ask the next SP you talk with what it's like in Poland. With the average monthly paycheck in Poland being around $40, few hams can afford commercial rigs.

The club was facing a major problem. When the government ran amateur radio they provided the club station and meeting room free of charge. Now the club was faced with having to pay $20 a month for the space . . . and the promise that this could triple or worse by the end of the year! Where would they ever get that kind of money?

I pointed out the importance of their attracting lots of youngsters to amateur radio as a way to make sure that Poland would have engineers and technicians. I suggested it might be possible to get American radio amateurs . . . particularly those from Polish families . . . to dig old ham rigs out of attics, cellars and garages and send them over . . . even if some needed fixing.

They're going to see if anything can be done with the new government to get the Polish airline to help ship used ham gear from America. The country won't be able to do much without a large supply of technically interested youngsters so they may get government cooperation.

Many years ago I arranged a similar deal for the hams in Jordan. Many American hams donated ham gear and technical books. The Royal Jordanian Airlines shipped them over and the clubs did the distribution.

The ham spirit I found in Poland was the way it was here in America back 30 years ago . . . before Incentive Licensing gutted our growth and our ham clubs. It was exciting to talk with them.

This group, despite all its problems, has six members licensed for packet, has several serious DXers, and is even putting its first repeater on the air. I've seen a lot less activity in some pretty big American clubs.

Dinner at the hotel restaurant was first rate and cost about 1/6th what I expected.

The Czech visa debacle gave us an unexpected extra day in Krakow, so Henryk took us to see their famous salt mines. It's worth the trip, if you're going to Poland. They've been in regular use for seven hundred years and go thousands of feet down. We visited a large church, a beer hall and even the place where Hitler set up to make airplane engines, with the first engine completed the day the war ended . . . all deep underground. It takes several hours to see everything. They have a museum showing how the mine used to be worked centuries ago . . . a model of the town a century ago . . . and many interesting exhibits.

The Krakow club is planning to set up a station deep in the mine next year and get a special call to commemorate the 700th year of the mine. A SP700 prefix. That will go well toward your WAM (Worked All Mines) award.

My gas tank was in the red again. The only gas pump in Krakow with unleaded happened to be right next to our hotel, so I filled 'er up . . . $20. That's more like it.

Our visit to Krakow was great. The only downer was the failure of the chap from the Polish record industry to keep his appointment. The hams knew several local producers of Polish folk and country music, so I'll follow up their leads when I get back.

Monday we zipped up to Kadowice and got our (grumble) visas. Then on across the (grumble) border with no problems (for a change). It was a long drive to Prague . . . 360 miles, but half

of it was on superhighways. We got there just too late for a meeting with the Czech record company, Polyphon, so I set it up for 8 a.m. Tuesday. Antonin OK1GW, the president of the Czech Amateur Radio Society, would meet me at 10 and we'd have lunch with his son OK1BWG at noon. Then off to Munich.

The people at Polyphon couldn't have been nicer. I think I'm going to be able to help them considerably with selling Czech music. This should help bring them desperately needed hard currency, now that the company is no longer state-run.

The Czech amateurs are very excited over their new freedoms. I've been promised a steady stream of news on that front. Antonin is a scientist working on infrared detection materials and his son is importing PC Clones from Taiwan, so I had hours of OSO to pack into a couple hours. Once you start asking, it's amazing what interesting people you can find on the air . . . if you ask for more than a QSL.

For the first time in 40 years, Eastern European hams are free to actually talk over the air. I think you'll find them excited over this new freedom and anxious to use it. . . so start asking 'em questions and sit back.

Despite the short time I had available, Antonin took us to see the Smetana memorial overlooking the Moldau River. I hope you're into classical music enough to be familiar with his "Ma Vlast" (my country), which includes "The Moldau." We also hurried through the old section of town, my camera snapping in every direction.

I wanted to capture the way it felt. We had a beautiful warm sunny day . . . in the 60s. There were crowds everywhere, some walking around happily, others patiently on line to buy hot dogs or ice cream cones. The cones were small and cost 25¢. They haven't invented hot dog buns yet, so you get a slice of rye bread and a dab of mustard on a paper plate. We also got on line for some rather greasy potato pancakes. Their subway was clean, fast and crowded.

By 2 p.m. we were checked out of the hotel, but we needed gas. Antonin knew where there was an unleaded pump . . . I think it was the only *one in* Prague. He led us there and then waved to us as we took off for Munich.

With the nice weather, once I hit the German autobahn I was able to drive at 120 mph all the way to Munich. When we arrived I got my travel folder out of my suitcase so I could call and confirm a dinner date. The business card with the needed home phone number was missing. I never lose anything, so I was incredulous. I went through everything we had and no card. I was supposed to call Helmut, but his card was missing too! Rats.

We were tired enough so we shrugged, packed up for the flight home the next morning and went to bed early. It wasn't until a week later, when no amount of unpacking turned up the missing cards and several letters with FAX numbers, that it hit me. That chap who was always standing by the elevator at our Krakow hotel and whose only job seemed to be to rush over and push the elevator button for us . . . could he have been a security policeman? Perhaps he wasn't just calling the elevator, but was warning whoever was going through our room. Well, I hope some ham and record company business cards and my missing letters will keep them busy until Poland figures out how to get their security people more productive work. And I was feeling guilty for somehow managing to lose the cards.

I'd like to hear from some Polish, Czech and other Eastern European Americans who'd like to get involved with helping solicit and ship ham gear to these countries. I can't think of a better use for a no-longer-needed rig. I'm sure almost every one of you has some old HTs, old tube gear and so on. We can help our newly-free fraternity brothers in Europe . . . but we're going to need someone to organize the projects. Yes, I'll do everything I can to help . . . and *73* will be solidly behind you. Here's our chance to personally help some new democracies work.

You know, it didn't take much money to make this trip. It's probably one you could have made, if you'd bothered. You just have to watch for travel bargains and take advantage of 'em.

There We Were . . . At 750 Feet!

Ask me how Wayne managed to be at the helm, piloting a nuclear hunter-killer submarine deep below the Pacific Ocean. Glad you asked. Piloting? Well, it's just like flying, complete with an aircraft-type steering wheel. You even wear a seatbelt . . . and need it.

Note the fiendish look on my face as I put the boat into a 33-degree up angle which has everyone aboard holding on for dear life. My old shipmates groaned in dismay when I sat down in the pilot's chair and took the helm of the SSN677. Many of them still remembered my legendary feats of helmsmanship on the SS228 some 46 years ago, when we were busy sinking Japanese ships.

Our old Drum (SS228) is tied up permanently in Mobile in Battleship Park. If you ever get a chance, pay it a visit. I think you'll enjoy reading about our adventures on the plaques as you walk through the boat.

Thirty-eight of us old Drum crew members were given an opportunity to go for a cruise on the new Drum (SSN677) . . . and that's how ol' Uncle Wayne ended up sitting in the pilot's chair, swooping around under the Pacific Ocean, obviously endangering 160 lives.

I started hamming seriously in 1938 so when WWII came along in December 1941 I was 19 and prime cannon fodder. I was going to college, but the Draft Board said never mind about that, we have some empty trenches just your size . . . we need you just as you are. So I quickly joined the Navy in 1942 as a Radio Technician, went through one of the best electronic schools in the world and reported aboard the Drum in 1943. I made five war patrols and left it shortly before the end of the war in 1945 to teach submarine electronics at the New London sub base.

Nuclear Drum SSN677 surfacing.

"Hold tight . . . here we go!"

Yes, I saw plenty of action . . . heard lots of depth charges . . . and we ran up a darned good score. I kept everything electronic working, was the radar operator when we were at surface battle stations, and ran the sonar when we were submerged.

Today's nuclear subs are bigger, but they have so much stuff crammed into them that the crews have less room to move around than we did 45 years ago.

You know, if you've a grandson who would like to learn electronics, I'll bet the Navy school on Treasure Island is still tops. It made my college electrical *engineering* education look like a dreadful waste of time. The Navy training gave me the grounding which enabled me to easily cope with every new technology which came along. It made it so I was able to help pioneer NBFM, RTTY, SSB, SSTV, repeaters, microwaves, microcomputers, speaker design, etc.

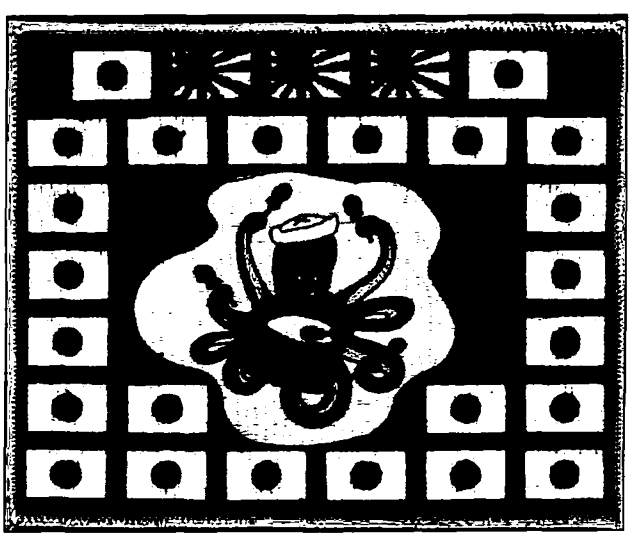
The recent collapse of the Communist system, if it is followed by the expected Soviet military budget cuts, could significantly lessen the importance of nuclear submarines. I loved the *Newsweek* encounter group cartoon where Fidel is sitting there groaning about the collapse of communism. Beside him is sitting the Pentagon groaning, "I know, I know."

The only real purpose for our nuclear submarine fleet is to counter the Russian nuclear subs. Sure, a few Third World countries have submarines, but they're old diesels and their crews are poorly trained.

Perhaps, if we pull our military forces out of Japan, we can get the Japanese to rearm and then we'll have to match them submarine for submarine, bringing happy days back to the Pentagon. The cost of rebuilding the Japanese military would also put an end to their cash surplus problems. Spending billions on military weapons which bring in no revenue will cool any country's economy.

Perhaps you'd better get your grandchildren into that electronics course pretty soon. Without the need for a huge navy and a big fleet of submarines, we're not going to need all those Navy electronic technicians.

But you know, after seeing the state of submarine electronic technology today, I felt a momentary twinge of regret over not having gone to work in the Anticosti Naval Research Lab. the way they wanted me to. Just momentary. 73



The Drum battle flag.

Number 24 on your Feedback card

ASK KABOOM

The Tech Answer Man

Michael Geier KB1UM
PO Box 64766
S. Burlington VT 05406

Power!

Once and for all, the correct Digi-Key part number for the Flavorig 10 mH choke is M7103. Not M70103 or M7100. That said, let's get started.

Absolutely everything that happens inside your equipment depends on one thing: power. Without it, your transceiver is useful only as a paperweight. Of course, this power usually comes from the AC line, but it can also come from batteries or even solar panels. The source does matter, but just about all the power used in today's equipment must be "purified" into steady DC before use. Let's examine why and how.

Goin' through Changes

All electronic devices can be thought of as modulators. The term "modulate" means "to change," and that's what circuits do. They take unchanging DC power and modulate, or change it, so that it does something, such as convey information.

For instance, amplifiers modulate DC power so that it rises and falls in step with the incoming signal—that's what amplification really is. Oscillators make the DC rise and fall at a regular rate, and with a particular wave-shape. It's kind of like a violin string, which takes the steady (DC) pull of the bow and turns its energy into a back and forth (oscillating) motion.

A radio, of course, combines many functions to accomplish the complex goal of wireless information transfer. There are oscillators and amplifiers, perhaps digital switching circuits, and a speaker, meter, etc. But in the end, nothing happens without the raw material to modulate, and that's power!

Supply and Demand

It's difficult and sometimes impossible to separate intentional changes from those already present in the raw power, so it's best to start with the purest power possible. What makes power pure? There are two basic elements.

First, the power should have no inherent changes of its own. That is, it should be well-filtered DC, with no ripple or noise riding on it.

Second, the power should be regulated so that it doesn't get pulled up and down by the circuits it drives until it is actually in those circuits, well-isolated from its source. That prevents changes (signals) from one circuit from influencing another.

The first goal is met through the time-honored technique of filtering. After being rectified from AC to DC, the power consists of rising and falling parts of a sine wave—one hundred percent ripple! Involving capacitors and sometimes inductors, filtering has the effect of inertia. It makes the power resistant to changes, so that ripple and noise are flattened out. The basic idea is to store some power in a capacitor, and then release it when needed. When the supply exceeds the demand, the capacitor can be recharged. In practice, this occurs during each cycle of the rectified wave. Thus, as the voltage rises, it charges the capacitor. Then, as the voltage falls, the capacitor releases its charge, keeping the final voltage level from getting too low. It's kind of like squirting water 60 times per second into the top of a bucket, while drawing a steady stream from a hole in the bottom. As long as there's some water in the bucket, and you squirt as much in as you take out, it works. Voilà, filtered DC.

The second goal is met by making the power source big enough to handle the demands of the circuits it drives, and by monitoring the voltage level and continually adjusting it to keep it constant. And that leads us into our next topic.

Just a Little Math (Really!)

We use the term "power" to describe electrical energy, but that's not exactly what it means. Electricity has two important elements, current (amps) and voltage (volts). Current refers to the number of electrons, and voltage is the "kick" or charge on each one. The power in watts is the current multiplied by the voltage, and represents the amount of work the electricity can do. Now that wasn't so bad, was it?

Nearly all circuits are operated at fixed DC voltages. As the resistance of a circuit varies up and down with the signal it is generating or processing, the amount of current (and thus the amount of power) varies with it. Much of that power winds up as the circuit's output signal, with the rest dissipated as heat. (That's why equipment gets warm.) So, if your power supply cannot deliver enough current, parts of that signal are going to become distorted. Also, the supply voltage may wiggle up and down, causing remnants of the signal to appear in other circuits (horrors!). Enter regulation.

The Regulator

No, it's not a new Arnold Schwartzenneger movie. Although it could be. The regulator keeps an iron fist on the voltage, ensuring that it will stay constant despite changing loads. Of course, there must be adequate current in the first place. No regulator can make something out of nothing. In fact, most regulators operate by *wasting* excess power and dissipating it as heat. Actually, there are two basic types: linear and switching. Let's examine each.

A linear regulator acts like a variable resistor, and is placed in series between the filtering circuits and the load. The regulator monitors its own output voltage and changes its resistance to keep that voltage constant. Of course, a resistance can only cut the voltage down, so it must be higher at the regulator's input than will be desired at its output. As the regulator varies, cutting the voltage down just the right amount to keep it constant, it burns the excess power (equal to the difference between the input and output voltages, multiplied by the current flowing through the regulator) and gets hot.

Despite its wasteful nature, the linear regulator is widely used. It is simple, reliable, and generates no electrical noise of its own. That last attribute makes it especially desirable for radio work, where any generated spikes or other noise can get into the receiver.

I'D Rather Switch

Switching regulators operate on an entirely different principle. Instead of acting like a resistor, a switching regulator acts like its namesake, a switch, rapidly turning on and off to provide just the right amount of power to the load. Imagine a switch turning on and off 1000 times per second. The input to the switch is unregulated DC. The output is filtered, and then the load. If, during the course of one cycle, the switch spends as much time on as it does off, then it is operating at 50 percent duty cycle. If it spends only 10 percent of the cycle turned on, then it is at 10 percent duty cycle, and so on. Now let's add a circuit which monitors the output voltage after it has been refiltered into DC, and adjust the switch's duty cycle to keep the output stable. This technique, called Pulse Width Modulation, represents the basic scheme of all switching regulators.

The big advantage of the switching regulator is that it doesn't burn excess power as heat. It simply blocks it, kind of like allowing only enough water to squirt into the bucket to keep the level stable. That makes this type of regulator tremendously more efficient, and much cooler, than the linear type. Unfortunately, it also introduces a potential problem.

Hash City

The rapid on and off switching of large amounts of power generates strong harmonics which reach far up into the RF spectrum. In other words, noise. When such a switching circuit is incorporated into a device designed to detect fractions of a microvolt of signal (in other words, a receiver), the potential for trouble is enormous. It is quite difficult to completely eliminate the noise because it is radiated from the wires entering and exiting the supply, as well as from the supply's components themselves.

But it can be done. There are a few supplies sold for radio use which incorporate switching circuitry, and they perform rather well. They cost considerably more than linear units, though, both because of the shielding problems and the increased complexity of their circuitry.

In the Beginning...

Now that we've explored regulators, let's look backwards through the power supply to where it all begins. There's more than one way to skin a synthetic fur, and it turns out that the switching regulator concept can be expanded to the design of an entire power supply!

In a traditional linear supply, the incoming AC power is passed through a transformer, where it undergoes voltage-to-current conversion. That is, its voltage is reduced while its current is increased by the same ratio. Remember, a watt is a watt. If you have 120 volts at 2 amps going in, you can change it to 12 volts at 20 amps and still have the same number of watts. In practice, there's some loss in the transformer, so the conversion isn't perfect. But for all intents and purposes, that's how it works. Then, the low-voltage, high-current power is rectified and filtered as I described earlier.

This approach to V-to-C conversion works fine, but the required transformer can get big and heavy when lots of power is needed. As I hinted above, there's another way.

Faster, Faster

The basic reason the transformer needs to be large is that the frequency of AC power is very low (60 Hz), and the iron transformer core will become saturated with magnetic force during the cycle and limit the amount of transferred power, unless that core is pretty big. If, however, you make your AC power have much higher frequency, say 20 kHz, then you can use a *much* smaller transformer for the same amount of power conversion, because considerably less power needs to be transferred per cycle.

Switching power supplies rectify and filter the incoming AC into DC right off the power line, with no transformer. Then, they chop it up at high frequency, pass it through a small transformer, re-rectify and filter it at the other end, and send it on its way to the load.

But what about regulation? Well, that's easy. Remember the switching regulator? Just make it adjust the duty cycle of the chopping oscillator, instead of a separate one. That way, just the right amount of power will flow into the transformer so that, after filtering, the output voltage will be where you want it.

It sounds simple, and in theory it is. In practice, though, lots of problems crop up, most of them associated with the fast switching pulses used. Various monitoring and protection circuits are incorporated to prevent the supplies from self-destructing from power line transients, short circuits in the load, and so on. So, switching power supplies tend to be complex and expensive.

By the way, nearly all desktop PCs use switching power supplies, and they are finding their way into radio gear as they are made spectrally quieter. Next month, we'll look at troubleshooting power supplies, both linear and switching.

Have a question? Send them to KB1UM at the above address.

ABOVE AND BEYOND

VHF and Above Operation

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MMIC Amps in Application

This month I would like to give several applications using MMIC amplifiers, including some high power amps. Our first example shows an MMIC amplifier providing switching protection to an expensive preamplifier. This project was published courtesy of the North Texas Microwave Society's newsletter, *Feedpoint*, from an article by Al Ward WB5LUA.

MMIC Converter Protection Circuit

Have you ever experienced the thrill of blowing out your rear end—that is, your transverter—by transmitting the 144 MHz IF into the down converter instead of the up converter? What you may not realize is that the action of pushing your PTT switch causes your 2 meter rig to transmit some amount of power in the form of audio noise. If you are daring and run VOX, break-in CW, or FM, the full power of the 2 to 10 watts is available at the output of the 2m rig. This is enough to gobble up any transistor fuse.

You say you have a relay in your transceiver that connects the 2m rig to the appropriate UP/DOWN converter, and that it's controlled by the 2m's PTT? The relay is an electromechanical device and may take as long as 50 milliseconds to switch, whereas the T/R switch in the 2m rig generally has fast switching pin diodes in the nanosecond range (1/1000 of a millisecond).

A solution to the problem is to build a box that has zero loss (gain = 1) in the forward direction and infinite loss in the reverse direction. This device is placed between the output of the down converter and the IF switch. See Figure 1. This allows the received signals to be coupled from the down converter to the transceiver with minimal loss. However, if high power were accidentally transmitted back to the down converter before it could be switched out, the signal would be attenuated enough to avoid "rear-end blowout."

The schematic in Figure 2 shows the circuit that offers low loss in the forward direction and 40 dB of loss in the reverse direction. I built it using whatever was on hand, and I tested it by cramming 10 watts of signal into the output and measuring the power that came out of the input.

In this case only 1 mW was measured for an isolation of 40 dB. Keep in mind that the resistors are only rated for several watts continuous, so 10 watts for a few milliseconds should not cause a problem. The MSA-0104 or MAR-1 will idle at 21 mA and only rise to 22 mA when the amp/attenuator is belted with a 10-watt signal. The only disadvantage is that the low level signal 1 dB compression point of the down converter has been reduced to about −20 dBm at the input of the amp/attenuator.

The current is optimized for the selected MMIC amplifier with the load resistor to set the desired current gain curves. See Table 1. The values listed are for optimum performance at 1000 MHz (1 GHz). You can home-brew the RFC by selecting a high value, ¼-watt resistor (1 meg) and winding about 12 turns of #36 wire on it. This will equal about 1 µH, and result in a good RFC.

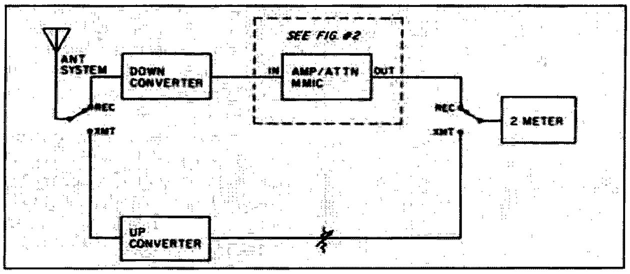

Figure 1. Block diagram of MMIC protection circuit.

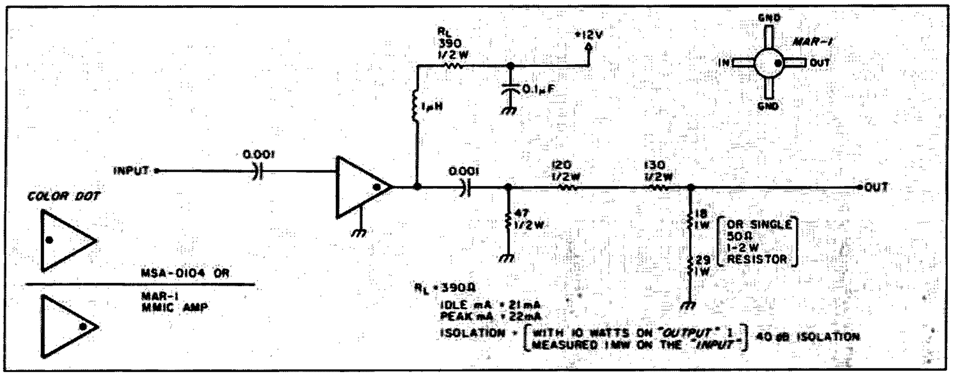

Figure 2. This circuit prevents "rear-end blowout."

Basic Amateur Band Preamp

The next application is a basic preamplifier using an Avantek MAR-0685 or Mini Circuits MAR-6 MMIC device (same part as far as I can tell). This preamplifier gives stable gain from 144 MHz to 2304 MHz, with a low noise figure to boot. See Table 2 for MMIC gain and noise figure data for each of our VHF bands.

The MMIC test amplifier was built on a small piece of microstrip PC board using chip capacitors on the input and output of the amp. The striplines are 50 ohms impedance and are terminated in a coaxial connector for easy mounting in a shielded box. The power is brought in with a feed-through capacitor. With DC voltage at 13.8 volts, the current drawn is 16 mA. See Figure 3 for the schematic details. Again thanks to Al WB5LUA for the circuit and test data. I have built several of these, and I use them for just about everything.

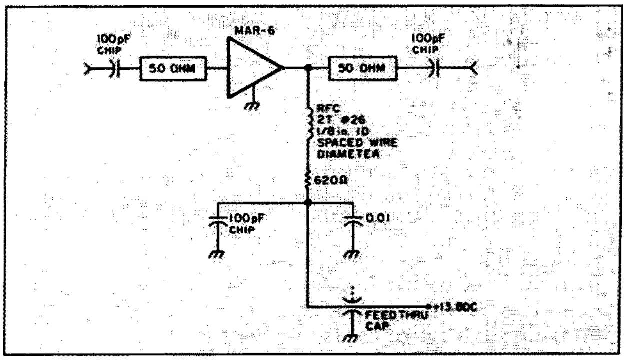

Figure 3. VHF Broad-band amplifier.

High Power Gain Blocks

Other high power gain blocks of interest to amateurs are in the Mitsubishi M577XX series of modules. The 1296 power amplifier module shows the M57762 rated at 20 watts output. The circuitry required to place this module and similar modules into operation is not complicated, since their input and output impedance is fixed at 50 ohms. Complicated matching circuitry isn't necessary.

Mitsubishi is not the only manufacturer of these devices. Motorola, TRW, NEC and a few others make similar power amplifier modules. These devices are made for so many different applications, it makes the head swim. My main point is that you should be aware of their existence, and if you locate one, you will know it can make a fine amateur gain block. If you run into a module that you can't identify, drop me a line and I'll see if I can help you locate information on it.

While Mitsubishi and Motorola gain blocks (power amplifier modules) are a little expensive ($50 to $70 each), they are easy to use and are worth the cost. The North Texas Microwave Group gets credit for a 1296 MHz amplifier circuit using one of the Mitsubishi 1296 power modules. See Figure 5 for details. The Motorola modules are used in a similar fashion, operating directly from positive 12.5 volts DC. See Figure 4, a 450 MHz amplifier using a Motorola power amplifier module.

In Figures 4 and 5, some of the fine details are left off, such as relay switching on both the power amplifier modules. In the case of the 450 MHz power module, note the easy construction. Just simple input and output RF connections, and bypassing on the DC voltage source. In Figure 5 the bypass and switching is a little more complicated because the module requires a switched 9 volts on transmit. The base of the 2N2222 switching transistor is keyed with positive 8 volts from the transceiver to provide this switching function.

Surplus CATV Gain Blocks

Some of the modules were made for cable TV. They are quite broad-banded in frequency, and make very good low power amplifiers for the amateur service. These modules might be easier to obtain through junk or scrapped CATV units. I have interfaced the output of a mixer with low power CATV modules, making a pre-driver for power amplifier stages. It worked very well. These modules have been used in projects for various amateur VHF frequencies, including 50, 144, 450 and 1296 MHz.

Power output of most CATV modules

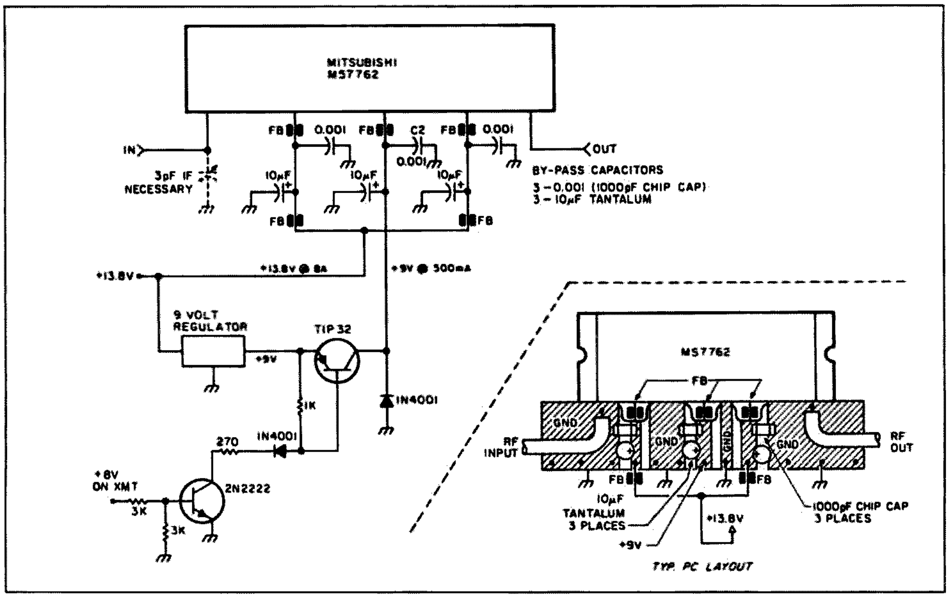

Figure 4. Mitsubishi 1296 MHz 20 W amplifier module.

Table 1.

Device	Max. mA	Normal Current mA.	Approx. Gain 1-GHz
MAR-1	40	20–30 mA	18 dB
MAR-2	60	30–40 mA	13 dB
MAR-3	70	30–50 mA	12 dB
MAR-4	85	50–70 mA	8 dB
MAR-6	50	15–25 mA	17 dB
MAR-7	60	25–40 mA	13 dB
MAR-8	65	30–50 mA	23 dB

Table 2.
MMIC Amplifier Performance

144 MHz	18.2 dB	2.7 dB N/F
220 MHz	18.3 dB	2.6 dB N/F
432 MHz	16.5 dB	2.8 dB N/F
902 MHz	15.0 dB	2.9 dB N/F
1296 MHz	13.0 dB	3.5 dB N/F
2304 MHz	8.8 dB	4.2 dB N/F

Table 3.

Mitsubishi	M-57762 1296 MHz	20 W
	M-57737 144 MHz	Power amp modules
	M-57735 50 MHz	Power amp modules
Motorola	MHW-720 450 MHz	20 W gain 21 dB
	MHW-802 825–915 MHz	2 W
	MHW-5122 40–450 MHz*	CATV type SYM to TRW
	MWA-110 thru MWA-310	General purpose hybrid
	DC–600 MHz	Amp TO-5
	MWA-5121 30–900 MHz*	27 dB gain 4 dB N/F
TRW	CA-4815H 10–1000 MHz*	17 dB gain 300 mW
	CA-4101 40–400 MHz*	17 dB gain 250 mW

*Gain Blocks (Modular) and CATV type Amplifier Modules

runs from about 100 mW to just over 400 mW for the higher power devices. Just about right for moderate drive to an amplifier. These CATV modules are available from both Motorola and TRW, as well through surplus CATV discards. (Table 3.)

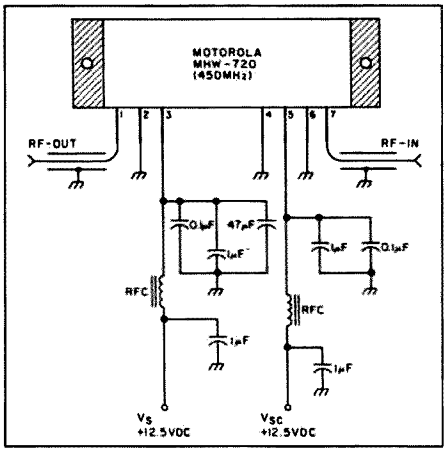

Figure 5. 450 MHz 20 W power hybrid amplifier from Motorola 21 dB gain.

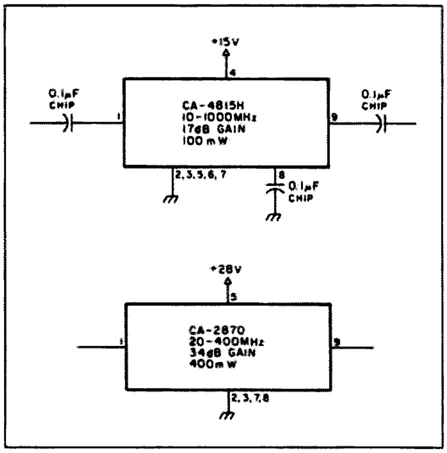

Figure 6. Typical CATV amplifiers.

Don't scoff at these CATV modules; using surplus devices, they can easily be made into moderate power stages. Some, not all, CATV amplifiers require equalizing circuitry to adjust them for a flat passband. Whatever type of device you locate, it will work well in amateur applications. Figure 6 is a schematic for an amplifier using a TRW 4815H module that I obtained from surplus.

This device worked from 10 MHz to just over 1100 MHz with 17 dB of gain, and a noise figure of 6.5 dB. I intend to use it to construct a converter for 902 MHz. This is the "basic building block" approach. It's low power now, but the final amplifier will depend on what I come across in my travels.

From the Mailbox

Jim WDØGTN wants to replace a klystron tube with a GUNN diode oscillator to convert it to solid state. He also wants to know if there are other interested microwave amateurs in the Wichita area. Jim also wanted to know how to convert from circular to rectangular. Circular (mode TE-11) can be converted to rectangular (mode TE-10) by using a dielectric lens. This is just a piece of Teflon™ cut in such a way that microwave energy refocuses as it passes through the material. I described a 10 GHz Polaplexer using this method with details for construction in the October 1988 issue of *73 Magazine*.

Tom Lloyd wanted more information, which I've been collecting, on 6 meter beacons. If you have any beacon information please send it to me, as I am compiling a new beacon list to be published soon. Gary AL7IH is building a 10 Ghz amplifier and reports Microwave Components of Michigan has changed their phone number.

Many readers want to know where they can buy components and PC boards for microwave projects. Some dealers require a large minimum order. Most amateur purchases tend to be small. If you can place a large order, as I sometimes do, you can get the minimum price. That is why from to time to time I offer parts and PC boards for projects at a nominal cost. At present I have in stock both 0.015 and 0.031 double-sided Teflon PC board material. A 4" x 5" PC board of 0.015 or 0.031 Teflon is available for $8 postpaid.

Suppliers for Microwave Components

California Eastern Labs handles NEC transistors, diodes and microwave GaAsFETs. Small purchases are allowed. The main offices are in Santa Clara, California, and the phone number is (408) 988-3500. I've dealt with them many times and highly recommend them. Also the Mitsubishi and Motorola power modules as well as an assortment of RF transistors are available from RF Parts, 1320-16 Grand Ave., San Marcos, California 92069. Phone: (619) 744-0728. In future columns, I'll add to the list of companies that deal in specialized components. As always, I will be glad to answer any questions covering microwave and related topics. Send an SASE for a prompt reply.

[See "Updates" in this issue for corrections to the schematic for the FET amplifier in the February 1990 column of "Above and Beyond."—the Eds.]

Homing In

Radio Direction Finding

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More Huff-Duff Ideas

A few months back I conducted a mini-survey to check our preparedness to hunt down jamming on the HF bands. I started down the ARRL Official Observers (OO) list for a section of Southern California, calling those who were listed as being involved in HF monitoring. I asked each one if he (no YLs were on the list) was equipped to perform mobile radio direction finding (RDF) on any HF band. After getting three-quarters of the way through the list without finding anyone who could do it, I gave up in dismay.

Most OOs are very good at looking up a callsign and sending out a notice to a Novice with key clicks, but they can't go out and find a non-identifying jammer or noisy power line on the DX bands. There are plenty of mobile fox-hunters to find repeater jammers on VHF-FM, but very few hams have equipped their vehicles for HF DF, or "huff-duff," as the military folks used to call it.

The Amateur Auxiliary needs your help. It's not difficult to track down HF jamming. Last month's column described the HF Homer, a simple RDF loop you can mount on your car and use with a mobile transceiver to hunt on the 10 through 17 meter bands. It has a SENSE mode to resolve the 180 degree ambiguity that plagues conventional loop designs.

Finishing Off Your Homer

By now your HF Homer should be built and ready to go, unless you couldn't find the variable capacitor. Just at press time, I learned that the Marlin P. Jones Company, the source I gave last month, has sold out of the AR-0091 air variables and will not be getting more. Fortunately, Surplus Sales of Nebraska (1315 Jones Street, Omaha NE 68102) has a good stock of Hammarlund miniature 100 picofarad air variables for $5.95 each, plus postage. The company's phone number is (402) 346-4750.

Photo A shows the loop mounted on the van, complete with compass indicator and pointer on the mast. When the photo was taken, I had not painted the loop and upper mast a dark color, as I usually do with such antennas to make them inconspicuous for hunting at night.

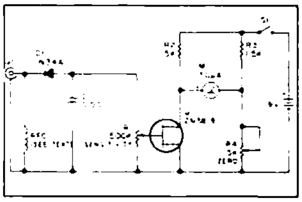

Figure 1. Schematic diagram of a simple field strength meter for "sniffing" with the HF Homer.

You can use the HF Homer with most 12 volt DC receivers, but some will work better than others. The receiver must be stable and well shielded.

Plastic case portables such as the Sony 2001-2003 series leak in too much RF and have excessive synthesizer noise, not to mention their lack of an S-meter.

Transceivers by the Japanese "big three" ham equipment manufacturers usually work fine, but make sure that the S-meter is sensitive and fast responding. Fast AGC time delay should be selectable in all modes. (On some rigs, AGC is always slow on SSB and fast on CW.) The ability to turn off AGC may prove helpful.

As you get into the neighborhood of the station you're hunting, the S-meter will read above S-9, where the meter scale compresses on most rigs. This makes it harder to use the SENSE mode. Turning down the RF gain control usually won't help. That typically causes the S-meter to stop working altogether. Only a handful of radios, such as the Uniden HR-2510, have RF gain controls that don't adversely affect S-meter function.

While a few receivers have internal RF attenuators, most require an external step attenuator box, such as the one shown between the mast and the transceiver in Photo A. Construction plans are in the T-hunt book, pages 55–60 (Moell and Curlee's *Transmitter Hunting—Radio Direction Finding Simplified* is available from Uncle Wayne's Bookshelf) and recent editions of *The ARRL Handbook*. The amount of attenuation switched in gives a clue to how close you are getting.

Huff-Duff Hunting Hints

Nearby power lines and other large objects can distort the pattern of RDF loops. Keep moving and take frequent bearings to average out these effects. Be sure not to get confused into hunting local noise instead of the target signal.

Remember that vertical loops give shallow nulls on skip signals. Test your HF Homer only on local ground wave signals. You're not going to hunt skip signals in your mobile anyway.

Sometimes when you rotate the mast to null a local signal, the received audio will begin to "echo" or get "watery." That is due to backscatter, the signal bouncing back via sky wave from some distant point. Backscatter usually is not a problem because you can determine the correct null direction by observing the quality of the audio.

Do not transmit into the loop or attenuator box. Disconnect your mike in case you forget. You may want to add a coax switch to select between the loop and your regular HF mobile antenna.

What about 20 and 40? The popularity of 20 meters means that it gets its share of malicious QRM. You can move the HF Homer to 20 by adding capacitance across C1 to reduce the resonant frequency. Add 82 picofarads to cover the 17 and 20 meter bands with tuning capacitor C2. The front-to-back ratio in the SENSE mode is not as good on 20 as on 15, but normal mode nulls are very deep.

Adding more capacitance to get to 40 meters isn't practical, because the loop signal pickup is too small on 40 relative to the "antenna effect." I have been trying out larger loops to get around that problem. An 81-inch circumference loop of the same ¼-inch O.D. copper tubing covers 40 with 330 picofarads added across C1. NORMAL mode nulls are a bit more shallow than with the 39-inch loop. In the SENSE mode, one null is deepened, and the opposite null disappears, creating a cardioid (heart-shaped) pattern.

Unfortunately, the larger loop on the HF Homer box is too unwieldy for mobile operation without some additional mechanical support. I plan to experiment more with the 81-inch loop on 40, and I welcome your participation and suggestions.

Closing In

To provide adequate documentation to help the FCC build a case, you must be able to conclusively demonstrate which house or apartment is the source of the signal, and preferably which antenna on the building.

There aren't many QRP jammers on the HF bands. To succeed at being disruptive, a jammer needs a good antenna and lots of power. Your mobile transceiver and attenuator won't be able to do close-in RDF because the strong signal will enter the receiver through the case and coax shield to pin the S-meter. The rig's RF gain control will not help when you are less than a block away.

A field strength meter (FSM), sometimes called a "sniffer," lets you use your loop to pinpoint the exact source of RF radiation by direction and amplitude. Figure 1 is the circuit of an untuned FSM that I designed to use with the HF Homer. Depending on the power and antenna that the jammer is using, the FSM begins to move up scale when you are three to six houses away, with the sensitivity control set to maximum. Reduce the sensitivity as you get closer.

All of the parts except the 50 microampere meter are at Radio Shack. You can probably find a meter at a local store or flea market. New panel meters are available for about $15 from Circuit Specialists, PO Box 3047, Scottsdale AZ 85271, (602) 966-0704. Build the circuit in a metal box to minimize RF leakage, using a suitable RF connector to mate with the HF Homer cable (I use BNCs throughout my RDF system).

This FSM uses a classic bridge circuit to give good sensitivity with a single field effect transistor (FET). Sensitivity is about 20 dB greater than the unamplified units sold for antenna tuning purposes. Full scale on the meter with R1 at maximum is 30 millivolts, measured from 10 to 450 MHz.

Frequency response is so flat that you could use it as a sensitive RF voltmeter if you calibrate the meter and R1 with a laboratory signal generator.

About 3 milliamperes flows through

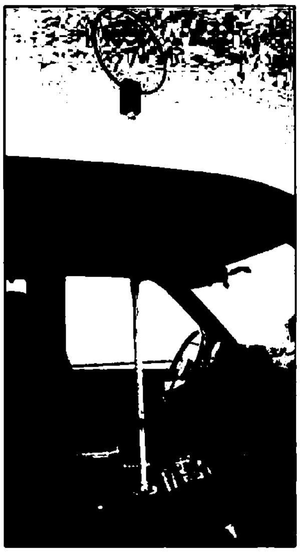

Photo A. The HF Homer system installed in the van, ready for hunting with a TS-130 transceiver and RF attenuator on the home-built center console. Coax and relay wires go inside the mast to the top of the tee-handle, then break out.

Q1 when no signal is received, decreasing as the incoming signal makes the FET gate input more negative.

R2 balances the bridge so that the meter current is zero with no signal.

R2 has enough range to zero the meter whether the battery (alkaline transistor radio type) is fresh (9 volts) or aging (6 volts). Temperature changes also have a minor effect on balance.

Disconnect the antenna from J1 when setting R2 for zero. If you can't balance the bridge, the quiescent drain current of Q1 may be too high or low. If so, try another 2N3819 or experiment with the values of R2-R4.

The RF choke (RFC1 in Figure 1) is not required if you use the FSM only with the HF Homer antenna, because the Homer provides a DC return path.

Some other antennas, such as those with gamma matches, don't provide a DC return. You will need a choke to use them with this FSM.

Choose the choke carefully. RF chokes have self-resonant characteristics that can upset the flat FSM frequency response, even if the antenna has a DC return. For 20 through 10 meters, use a 15 microhenry choke such as Miller 70F155A1. For 2 meters, a 1.0 microhenry part is a good choice.

To use the FSM on both HF and VHF, use both chokes in series. Circuit Specialists carries the Miller chokes.

To sniff on foot, add a SENSE/NORMAL switch on the FSM box to supply HF Homer K1 coil voltage from the 9-volt battery through a 33-ohm ½-watt resistor.

Now you're all set to help rid the DX bands of illegal antics and electronic pollution! A final request: Please don't be a Lone Ranger. Join the Amateur Auxiliary and your Local Interference Committee by contacting your ARRL Section Manager. Working with the Auxiliary protects you and multiplies your effectiveness.

Number 27 on your Feedback card

73 INTERNATIONAL

Arnie Johnson N1BAC
103 Old Homestead Hwy.
N. Swanzey NH 03431

Notes from FN42

Good news continued from the April issue: another new Hambassador! Mahmoud Idera-Abduliah EL2CE has volunteered to become the Hambassador to Liberia.

My trip to EI-land this summer has unfortunately been cancelled. I had a wonderful conversation with Peter EI8GM on 10 meters right after I had submitted my April column. Peter told me to learn how to whistle because that is the easiest and cheapest way to bring up the repeaters in Ireland. When I do make my trip I'm sure I will have a lot of explaining to do to my wife and fellow travelers in the bus as to why I keep whistling. Anybody have any good excuses that are believable? (Mary already knows that the Irish girls are pretty.)

I received an inquiry from Melvin Seyle WA3KZR as to the address of West Siberia DX Club, the granters of the beautiful certificates that have been highlighted in the past six issues. Inquiries should be sent to: Sergey F. Kruglov UA9MC, PO Box 836, 644099, Omsk-99, USSR. I have a few of the requirements for the certificates but do not have the space here to put them in. I will put them on the 73BBS in the 73 International SIG.

Who will be next with some beautiful certificates, suitable for publishing and acquiring? Send them to 73 and we will see what can be done.

Now, on to the good stuff!—Arnie N1BAC.

Roundup

Brazil L.A. Cruz PY7AHJ reports that the International Amateur Radio Net, IARN, created by the late Gil Baker W5QPX is planning a world telecommunications celebration during the month of May to highlight Telecommunications Day.

Italy Mario Ambrosi I2MQP, Segretario Generale and DX & Award Manager of the Associazione Radioamatori Italiani, ARI, announces that the ARI International DX Contest will always be the third weekend in April from 2000Z Saturday until 2000Z Sunday. This year it will be April 20 to April 21.

Mario wishes to emphasize that this contest is now a worldwide competition and hopes that many of our readers will take part. [*We just received this info and hope that many of you will receive your May copy in time to take part.—Arnie*]

Japan From the JARL News: The JARL's General Assembly of 1990 is planned to be held on May 27 at Kanazawa City in Ishikawa Prefecture. This important General Assembly, held in May every year, adopts resolutions about a yearly activity program and budget with the opinions of JARL's members being faithfully reflected therein. Some 1,300 members from various parts of Japan gathered to attend the Assembly of 1989, held in Noboribetsu City in Hokkaido.

Latvia Ed Shakalis KA1QOF reports that during a conversation with Alex YL1WW it was mentioned that Latvia hams have a net operating weekends on 28.660 at 1400Z, 21.360 at 1500Z, and 14.390 at 0500Z. All frequencies used depend upon RF conditions.

It is also apparent that Latvia is now using the YL prefix and Estonia is using the ES prefix. [*I can attest to both because I too talked to Alex YL1WW on Feb 3 and to Vello ES1QD on Jan 27.—Arnie*]

Switzerland From the International Telecommunication Union (ITU) Press Release: The ITU and the Posts and Telecommunication Corporation of Zimbabwe (PTC) have agreed to organize jointly AFRICA TELECOM 90 at the Harare International Conference Centre (HICC) and the Sheraton Hotel in Harare, Zimbabwe, from 4 to 9 December 1990.

This event will be comprised of an exhibition and a Special Session of the World Telecommunication Forum, both to be held in pursuance of a Recommendation adopted by the ITU Plenipotentiary Conference, Nice, 1989.

Further information may be received from the AFRICA TELECOM 90 Secretariat, ITU, Place des Nations, CH-1211 Geneva 20, Switzerland.

AUSTRALIA

Ken Gott VK3AJU
38A Lansdowne Road
St. Kilda, Victoria 3183
Australia

Thirteen years as an editor of American-owned publications finds me sometimes a bit confused over respective US, UK, and Australian style and usage of the "English language." I think the US calls the device a "slingshot" and the British a "catapult." Colloquially, we call it a "shanghai." Anyway, I've always kept one with my gear for portable ham operations. With a ¼ inch lead sinker attached to some monofilament fishing line, and the line stored on one of those handcasters from which it will flow off freely, it is a superb means of getting a line over a high tree branch and pulling an antenna up via the line.

Imagine my shock and dismay when I learned last year that our VK3 state government had banned the sale and use of slingshots! So, I fired off a letter to the Minister for Police and Emergency Services, under whose jurisdiction the matter lay. Naturally my violin sang when I described the inestimable services rendered by amateurs in earthquakes, floods, fires, and other disasters, and the vital role of the catapult/slingshot/shanghai in the portable operations which provide our training for emergencies.

Behold the response: victory, triumph!

PRESCRIBED WEAPONS REGULATIONS 1989

I refer to your letter requesting an exemption from the above Regulations to enable the use of slingshots in the pursuit of your hobby as an amateur radio operator.

I am pleased to be able to tell you that the following exemption was recently approved by the Governor in Council: "Sections 4(j) and (k) [which relate to slingshots] do not apply to amateur radio operators where the articles are used in pursuit of that hobby."

[*Who says that our officials don't listen!—Arnie*]

I've already mentioned how the North American stations scooped all the low-numbered certificates for the WIA 80th Anniversary Award. I'm trying to set up some weekends where there will be lots of VKs on the air to enable more overseas amateurs to qualify for the award. Naturally, we have to avoid weekends which are booked for major national and international contests. Since the WIA 80 Award involves membership numbers from the VK contacts, QSOs made in contests won't serve.

We had our worst earthquake in Australian history in December and the only one in which lives were lost. It affected an urbanised area in Newcastle, second city in NSW. While I'm sure that amateur radio helped in the aftermath, I've got absolutely no details.

The quake took place in the run-up to our major holiday season, and at a time when all WIA broadcasts to members had ceased for a couple of weeks. When the WIA federal office reopened after the summer vacation, I called in but no news was on hand on the role of amateurs in the quake. As soon as information is available I will relay it to you.

Cheers, Ken, VK3AJU

[*I'm afraid that I messed up the date for Australia's National Day in January. Ken set me straight and I got a history lesson as well. I promise that I will never do it again.—Arnie*]

ISRAEL

Ron Gang 4X1MK
Kibbutz Urim
Negev MPO 85530
Israel
Packet: 4X1MK *4Z4SV*

Hams and Rumania

Once again, in times of disaster, either natural or man-made, amateur radio provides communications where all else fails. In December, when the Rumanian revolution took place, multitudes of Israeli citizens were desperate for news about the well-being of their relatives in Rumania.

An emergency traffic net spontaneously came into being between here and the then beleaguered country, relaying more than 1000 health and welfare inquiries. In Rumania, Pit YO3JW, Andy YO3APJ, Cezar YO3YC, Dan YO3JX, and Ovidiu YO3BDP (all of Bucharest), Nelu YO6AWR of Brashov, George YO2BB from Timishuara, and Fery YO4BX of Constanza did outstanding work.

On this end the traffic was handled by Morel 4X1AD, Shalom 4Z4BS, Jan 4X6WB, Emil 4X6YU, Hardy 4X6VH, Paul 4X6UU, Micky 4X4FL, and Ilan 4X6VJ.

On another front, Eyal 4X6RE, a member of the Red Star of David (the Israel equivalent to the Red Cross) was coordinating with Rumanian hams, for the Rumanian Red Cross, the dispatch of a transport-plane load of first-aid supplies from Israel to the civil war stricken Rumania.

As in the past, when the chips were down, amateur radio operators proved themselves as reliable, efficient, untiring and selfless volunteers to help their fellow humans in the common effort to overcome calamity.

Silent Keys' Forest

The Keren Kayemet Le'Israel (Israel Forestation Authority) has informed us that from the beginning of this year, the fee for having a tree planted and the mailing of the certificate for people from abroad has been raised to seven dollars. See the previous edition of this column that detailed how one can have trees planted in the Silent Keys' Forest to either honor or be a memorial to someone.

Grade "B" Course Begins

The Center for Technological Studies of the Open University has started a new correspondence course for the "B" Class (General) license. They will conduct theory examinations, and will supply all the study materials. Applicants will be put in touch with ham clubs for learning Morse code. The cost of the course is 320 shekels ($160), and is no doubt well worth it, with the first-ever printed complete study guides in Hebrew for this license class.

Spotlight on 4X4HO

When in other countries ham radio has turned into an old man's hobby, with the average North American radio amateur being in his fifties, the Israel Amateur Radio Club boasts the average age of its membership as 24 years old (statistics from 4X4GF)! Much credit must go to the youth clubs, the most prolific and longstanding being 4X4HO, at the Tel Aviv Youth Center.

4X4HO is open 5 evenings a week, Sundays through Thursdays. At present there are 50 people enrolled who are candidates for February's Novice examinations, and continue on

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to Grade B. Most are high schoolers, but there are also adults learning alongside eleven year olds! During the summer vacation the club station was open in the mornings, so the members had plenty of opportunities for hands-on operation.

Every Israel Independence Day, 4X4HQ does a special 24 hour operation, with a special callsign. This year it was 4X41ID celebrating Israel's 41st birthday; next year will be 4X42ID, of course! The station sports a TS430S transceiver and TL922 amplifier keeping a variety of antennas spewing out energy on the HF bands, while a FT227R on 2 meters keeps the HQers in touch with the inside of the country.

LIBERIA

Mahmoud Idera-Abdullah EL2CE
PO Box 20-4262
1000 Monrovia 20
Liberia, W.A.QL

The year 1990 is well underway and we are looking for bigger and better things for amateur radio for this present year, particularly here in Liberia. For one thing, we are very happy to appear regularly once more in the "*73* International" column. It has been a while since Brother "Don" Steffers EL2AL departed, June 1985 to be more exact.

Liberia, as most hams worldwide may not know, is on the west coast of Africa. It sits on what some might call the "Southwestern Bulge" of Africa, bordering Cote D'Ivore on the east, Guinea to the north, and Sierra Leone on the west.

For many amateurs it would be considered, at times, a rare DX country. Many have never had a contact with an "Echo Lima" station and relish the thought, so operating from Liberia can be quite exciting when the pileups come your way.

Liberia, like most African countries, is considered to be a "developing" nation. All things being equal, it might be more developed than many others in the "subregion."

Because Liberia is developing, ham radio is clearly developing as well. The Republic of Liberia is Africa's oldest sovereign nation, having declared its independence in 1847. However, amateur radio did not get started here until the 1930s. It was quite possibly the first country south of the Sahara to issue amateur radio licenses.

The first license issued to a Liberian was in 1938. Since that time there has been a steady but very slow growth of the number of Liberian-born amateurs. Their numbers lag far behind the number of expatriates that now hold amateur licenses here in Liberia. Liberians make up about 10% of the total number of hams licensed in 1989 by Post and Telecommunications, the authorizing government ministry.

Part of the slow growth is due primarily to the absence of an ongoing program of amateur instruction and education. Many of the amateurs who participate in these programs are often here for short tours of duty with an embassy, VOA, or a mission. Therefore, when they depart there is no one to step in and continue the program, creating a lack of continuity of license courses.

A second factor that keep Liberian amateurs off the air is the high cost of ham gear on this side, and its availability. If an individual is able to find a tutor, study materials, and the patience to master Morse code and theory, finding affordable equipment can be a big problem.

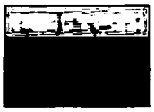
The Liberian Radio Amateur Association, the nation's radio society, is planning to take steps to help remedy the situation. Plans are being made to set up regular radio classes for all those interested. We would like the schools to be involved, maybe implementing an amateur radio course as part of the regular curriculum.

Also, in line with the effort to promote and create an interest throughout the country, a club station is being planned; land has been looked at, and hopefully construction can be started as soon as a final site is chosen. Of course this would be fully equipped, which would allow those without their own equipment to get on the air. These are only two small but significant moves to aid the development of amateur radio in a Third World country.

For these steps to be successful, it will take the efforts of both the local and the international radio community, their expertise, technical knowledge and experience, along with unprejudiced advice, for amateur radio to grow in Liberia.

For those that are genuinely interested, you can write for a sample copy of the LRAA Quarterly Newsletter, *Echo Lima News*. I would be glad to send you a copy.

Until next time, 73, from tropical West Africa. Let's work to develop amateur radio in a developing country.



LITHUANIA

Jonas Paskauskas LY2ZZ
PO Box 71
Siauliai, 2354900
Lithuania

The first ham convention, organized by the World Lithuanian Amateur Radio Net, will be held in Vilnius, the capital city of Lithuania, in early June. In addition to the convention, organized tours will be provided to the participants to historical sites and points of interest.

To date, 20 amateurs from Europe and the United States have registered to attend. For more information and registration, contact LY2ZZ by mail or on 28.444 (±) at 1500Z weekends and some weekdays.

Number 29 on your Feedback card

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The *73 Flea Market*, Barter 'n' Buy, costs you peanuts (almost)—comes to 35c a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

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. . . de K6MH

Who's Killing Ham Radio?

No more gloom and doom. We ain't dead yet. Having heard the rumors, us die-hards are searching far and wide for healers, herbs, nostrums, and holistic medicine to revive the hobby that was once the love ol our lives.

Who, or what is doing in ham radio? Let's not harp on the incentive licensing fiasco. Wayne has covered that. Let's not mention five of the most respected hams in the country requesting the resignation of ARRL's president for failing to act in a way to protect our hobby. Nope. Let's look elsewhere.

The Fishbowl Effect

Why are telephone modem BBS's spreading like wildfire, while amateur radio just stands there looking?

One argument is that the phone BBS's are open to anyone. No license required. Private, QRM-free point-to-point communication is there for anyone with a computer and modem and a modest budget for phone bills. Friendly. Democratic. No one has to run the code-and-theory gauntlet.

Like the telephone, amateur radio is intended for point-to-point communication. But the nature of radio is that anyone who wants to can listen. Phone lines are private. Hams have no privacy.

Every ham who goes on the air might as well be living in a fishbowl. Anyone could be listening. Who knows what they might think if you should say the wrong thing? So we get timid people afraid to say anything except what they've heard someone else say. We have grandstanders who talk too much about nothing you can have any feelings about. We get all kinds of playacting. There are still hams who along with the Pope, refer to themselves as "We." It's stage fright, or mike fright, isn't it?—having to calculate what you can say instead of feeling free to say anything you wish. This uptightness could do us in.

On phone lines, we're guaranteed privacy by law. The opposite applies to amateur radio. The law requires that what you say be transmitted in standard modes. Inventing a new mode that works only between you and a friend is a no-no.

It's a public medium. We're public figures. It's like visiting a nude beach, your visibility may bother you til you get used to it. High visibility public figures do one of three things: overact, freeze up, or just be themselves anyway. The third response is our survival route, if we can relax and enjoy it.

It can be a kick to be "on the air." But the "act" some of us slip into is stultifying even to ourselves. Listen across the bands. Do you hear ham actors? Do you hear the dying yawps of Dodo birds? Is there hope for this endangered species?

Youth

Think of the exciting things you were ready to jump into when you were young. One summer when I was ten I wrote out a list called "Neat Things To Do" that ran to about 30" long in small print. Did you do that too or just keep them in your head? How much of your list have you shared with others, or even remembered for yourself in the last ten years? Did you get adult and proper and forget all about it? Are Tom Sawyer, Becky and Huck Finn still alive in there somewhere?

I believe that anyone who is alive and breathing has that same spark, that free spirit, even if it's nearly smothered under layers of garbage.

Wildness

Burned into my brain along with the beauty of Sierra Club nature photographs is their quote of Thoreau: "In wildness is the preservation of the Earth." Could this apply to ham radio? Please note that wildness does not mean getting drunk, putting a lampshade over your head and trying to be funny. It means being free, natural, and uninhibited. It means being yourself for all to see and hear, without fear. It's beautiful. It's fun. It IS wild.

Do you feel good letting would-be hams listen to our bands, or fear turning them off?

What if the bands were full of "wild" humans having a ball just being themselves? Recall the most fascinating talk show you ever wanted to phone in to. Couldn't a 2 meter repeater be that much fun and more?

We're not supposed to transmit music via ham radio. But unless we let some of the music in our souls sing out, our hobby could just dry up and blow away.

Eric Berne's *Games People Play* is based on the old saying: "If you are not stroked, your spine will shrivel up." How about contributing a few strokes to the backbone of ham radio: live messages, friendly messages, messages with juice? Forget your high visibility, or enjoy it. Be yourself, not the Pope, not Super-Ham, but YOU . . . expressing what YOU think and feel. It's wild. It's where the juice is. It's more refreshing than Coke.

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 Chateau Circle
Payson AZ 85541

Propagation conditions on the HF bands begins to decline from their March–April peak toward the normal summer conditions, although with the peak sunspot numbers about to occur for Cycle 22, conditions ought to be very good, indeed. . .

The first week of the month will exhibit fair-to-poor DX conditions with possible magnetic field upsets around the 4th, 5th, and 6th. Gradual improvement will take place through the 8th, and the following two weeks should provide generally quiet magnetic field conditions and good-to-excellent DX opportunities.

This period tends to be fairly stable, ionospherically speaking, so you should make the most of this opportunity to work worldwide DX. As June and July approach, keep a sharp ear peeled for super VHF-UHF propagation. As always, tune to WWV (10 MHz or 15 MHz seems best) at 18 minutes past the hour for the latest update on the magnetic field indexes (lower is better) and for the solar flux data (higher is better).

See you next month.

EASTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	—	20	—	—	—	20	20	—	—	15	10/15
ARGENTINA	15	15/20	20	40	40	—	—	10	—	—	10/15	10/15
AUSTRALIA	10/15	20	20	20	20	40	20/40	20	—	—	—	[illegible]
CANAL ZONE	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
ENGLAND	20	40	40/80	40/80	40	—	—	15	10	15	15	20
HAWAII	10/15	15	20	20	20/40	20/40	20	20	—	—	—	10/15
INDIA	20	20	—	—	—	—	—	15	—	—	—	—
JAPAN	10	—	20	—	—	—	20	20	—	—	15	10/15
MEXICO	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
PHILIPPINES	15	—	20	20	—	—	20	10/15	10	—	—	15
PUERTO RICO	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
SOUTH AFRICA	20/40	40	20	20	—	—	—	—	10	10	15	15
U S S R	40	40/80	20	20	—	—	—	10/15	10/15	—	20	20
WEST COAST	20/40	20/40	20/40	40	40	—	—	10/15	10/15	10/15	10/15	20

CENTRAL UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10/15	15	20	20	20	—	20	20	—	—	—	10/15
ARGENTINA	15	15	20/40	20/40	20	—	—	10	—	—	10	10/15
AUSTRALIA	10/15	15	15	—	20	20/40	40	20	—	—	15	10
CANAL ZONE	15/20	15/20	20/40	20/40	20/40	—	—	15/20	15/20	10	10	10
ENGLAND	40	40/80	40	—	—	—	—	—	15	15	20	20
HAWAII	15	15	15	20	20	20/40	40	20	—	10	10	10
INDIA	15	15/20	—	—	—	—	—	10/15	15	—	—	
JAPAN	10/15	15	20	20	20	—	20	20	—	—	—	10/15
MEXICO	15/20	15/20	20/40	20/40	20/40	—	—	15/20	15/20	10	10	10
PHILIPPINES	10/15	—	20	20	—	—	—	—	10/15	10/15	—	—
PUERTO RICO	15/20	15/20	20/40	20/40	20/40	—	—	15/20	15/20	10	10	10
SOUTH AFRICA	—	—	20	20	—	—	—	—	15	15	15/20	20
U.S.S.R	—	—	—	—	—	—	—	15	15	15	20	20

WESTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10/15	10/15	15	20	20	20	—	20	20	—	—	15
ARGENTINA	10/15	15	15	20	20	—	—	—	—	—	10	10
AUSTRALIA	10	10/15	15	15	20	20	20	—	20	—	—	—
CANAL ZONE	10	15	15/20	20/40	20/40	—	—	—	10	10	10	10
ENGLAND	20	20	—	—	—	—	—	—	15	15	15/20	20
HAWAII	10/15	10/15	15	15/20	20/40	20/40	40	—	15	10	—	—
INDIA	—	15	20	—	—	—	—	—	15/20	15	—	—
JAPAN	10/15	10/15	15	20	20	20	—	—	20	—	—	15
MEXICO	10	15	15/20	20/40	20/40	—	—	—	10	10	10	10
PHILIPPINES	10	10	—	—	—	—	—	20	15	15/20	—	—
PUERTO RICO	10	15	15/20	20/40	20/40		—	—	10	10	10	10
SOUTH AFRICA	20	20	—	20	—	—	—	—	—	10	15	15
U S S R	20	—	—	—	20	—	—	20	20	20	20	20
EAST COAST	20/40	20/40	20/40	40	40	—	—	10/15	10/15	10/15	10/15	20

* Try next higher band on G days. (1) Possible opening on this band on G days. (2) Try ... Note A: Use values of 10/15 for 12m, 20 for 17m, 40 for 30m. Note B: This chart refers to the highest band possible at the time indicated. If no luck, try next lower band.

MAY 1990

SUN	MON	TUE	WED	THU	FRI	SAT
		1 F-P	2 F-P	3 P	4 P	5 P
6 P	7 P-F	8 F	9 F-G	10 G	11 G	12 G
13 G	14 G-F	15 F	16 F-P	17 P	18 P-F	19 F
20 F	21 F-G	22 G	23 G	24 G	25 G	26 G
27 G	28 G-F	29 F	30 F-G	31 G		

73 AMATEUR RADIO

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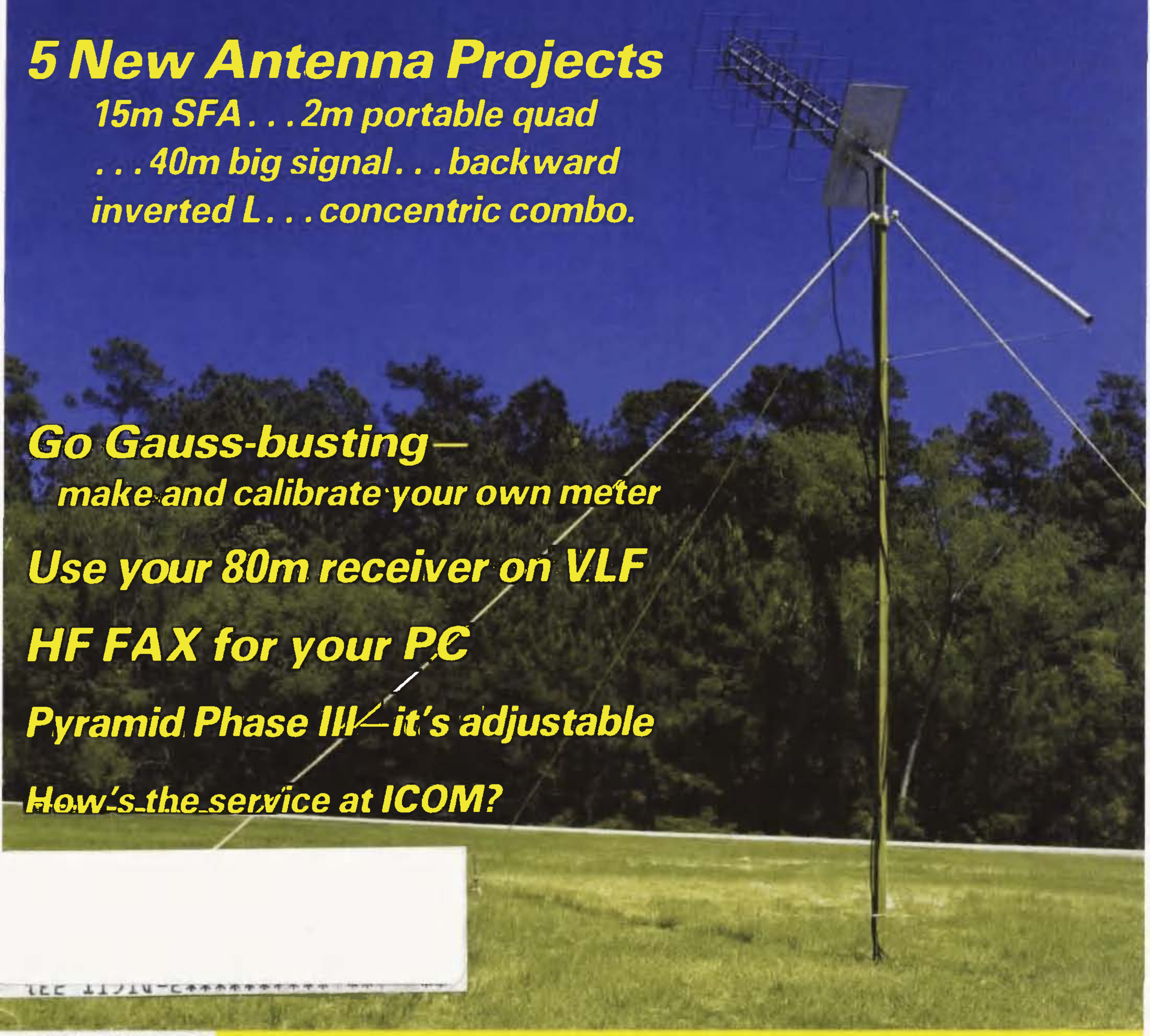

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HF FAX for your PC

Pyramid Phase III—it's adjustable

How's the service at ICOM?

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LETTERS

From the Hamshack

Dear Wayne

Jim Kocsis WA9PYH: It looks like what you said about selling the RF spectrum is a real possibility. People who don't think we could lose spectrum space should read page 15 of the February *RF Design* magazine. Oh well, this is just a hobby, right? Keep up the good work at *73 Mag.*

I'm saving to bid for 3 kHz on 220 . . . Wayne.

Jeff Market KD2HN: I've been almost completely QRT for most of the last ten years. Part of that is due to family time and money constraints, but most of it can be attributed to the senility of ham radio. As you have written over and over, most hams seem to be over 60, so their interests and concerns are not mine. I'd like to rag chew with folks my own age. Age isn't the only problem. Every time I've tried hamming I've been turned off by rag chews which amount to name, weather, rig and 73s. Any attempt at a real conversation brings, "Well, it's been a real nice QSO. 73 and see you down the log." It was simple, too discouraging. An up note . . . I recently came across some hams close to my age in my area, so maybe I'm back. I've got a TNC coming and, for the first time in years, am thinking of upgrading.

Eugene Drake N6ORO: Why doesn't ham radio grow? Ask my son. He's 23, has an Advanced ticket and proctors VEC exams. When the fellows he's Elmered have tried the HF bands, they are pushed off by: "It's time for our net now, please move." Never an offer to join the net as a guest. I'm going to try packet. Keep rattling the cage, Wayne.

I hate that too. When some officious op comes on and demands I move because I'm on the frequency of a net which will be starting soon, I'd like a 50 kW amplifier and a rhombic for his direction . . . Wayne

Joel Jones W4JQB sent a clipping about the Agilis packet spread spectrum module getting FCC approval. This service will "share" our 902–28 MHz band. Well, as we lose more of the band to commercial developers, there's an opportunity for ham entrepreneurs to go into business. Says Joel, "I remember your campaign back in the '70s to save 220, but look what happened. Looks like the ARRL, with their current initiatives (or lack thereof), is stomping ants on the front porch while elephants are coming in the back door."

Steve Uhrig W3SWS sent a brochure from L-Tronics about the new Personal Emergency Locator Transmitter (PELT) service the FCC has proposed for the 220–222 MHz band they just took away from us. It looks as if the FCC doesn't know just what to do with it. Well, like the 902 packet deal, at the least this is another good opportunity for ham entrepreneurs to use their technical smarts and get into the PELT business. The idea is to set up systems to help lost or hurt hikers.

Bob Kern KL7NC: I've been meaning to write you concerning the various topics you've talked about in your editorials over the years I've been reading your great magazine. The March editorial about desktop publishing and your new publication idea really got my juices flowing. We bought our first Mac four years ago, then bought another and another. We now produce our weekly paper on the Macs. They're easy to use and have saved us thousands of dollars. The paper has enabled us to buy a three-story building and feed eight families. Two or three people, a small office, a couple Macs and a LaserWriter are all that's needed. Now, that confounded ARRL Automatic Station proposal . . . have they gone truly bonkers, or are they just trying very hard to kill the wild-fire growth of the packet/AMTOR message handling system in favor of their old NTS system? In spite of needed improvements, packet is the most efficient traffic-handling system yet devised for ham radio. Since putting my PBBS on the air 8 months ago, it has handled nearly 15,000 pieces of traffic to and from other automatic stations up and down the West Coast . . . and my little station is just a spur off the main traffic networks. N6VV handles that much traffic in a month! The ARRL's proposal to jam all the packet, RTTY and AMTOR automatic stations into 10 kHz sections of each band is shear madness. The 40m proposal (7030–7040 kHz) is particularly diabolical in that it will bring the CW people into the fray as well.

Could the proposal's main purpose be to protect the rapidly fading old ARRL traffic net system? It makes sense to me . . . Wayne

Jack Goldsworthy KA6EPF: The Santa Barbara ARC has just started new classes, with 30+ in the Novice class. Many are under 21. We also have a class in a private school. We're trying to do it right. I'll have pictures later.

Send the pictures, send the pictures . . . Wayne

Jeff Kinsman NH6VH: As I am a new Technician, you may be interested in my perspective. Amateurs seem to be a rather closed society . . . they don't volunteer much information about the hobby. I had to really hunt down someone to help me with my ticket to break into the hobby. The local club didn't provide any classes. Now, the code . . . I truly believe that code is holding the hobby back. Technology had outdated the code. It belongs with other outdated facets, like crystal sets and tubes. It's fun to play with and be nostalgic about, but out of the mainstream. Forcing people to learn the code to pass the exam needlessly burdens our hobby and is jeopardizing our future. How long will the FCC hold bands open that we aren't using?

"Gib" Gibson W7JIE: Thank you for your many "good" editorials . . . particularly April, where you mentioned amateurs' poor showing in public service. For several years now Wayne Moddison K6OOW and I have been publishing a small booklet which lets hams know about the public service events around Seattle. There are 52 listed, along with who to call and their phone numbers, for those interested in participating. We have over 3,000 hams around here. How many help? Never enough for the need. The booklet was first put out at our expense, but this year ICOM picked up the tab in return for an ad on the back cover. We also list all the local repeaters. At least out here we're doing something about public service and ham participation. Note, on Aug. 3rd there is a Seafare Torchlight Parade. This alone takes 60 hams to provide the communications needed . . . and we do it! How do we get publicity for all the work we do? Our two ham PR experts are "retired and too busy," so we go ahead and do it anyway.

The booklet is a great move . . . good use for desktop publishing. But every club needs to appoint PR people and see that they get news of public service activities to the newspapers, radio and TV media. Think of public service having two objectives . . . one to help, the other to advertise amateur radio and help interest youngsters in our great hobby. I suppose I'll have to write more editorials on how to get PR. Just what you wanted, more of Wayne's editorials . . . Wayne

Klaus Spies WB9YBM: The state police gave me a warning for wearing an ICOM HS-10 headset. My explanations that it covers only one ear were ignored.

Check the law and see if it says headphones are illegal . . . note the "s." If a single headphone is illegal in Illinois you need a new law. The human ear system is incredibly efficient when it comes to separating sounds. You can have deafening music in one ear and still hear a pin drop with the other. If one headphone is illegal that's crazy. The idea is to force motorists to be able to hear car horns. I don't see any difference between a one-phone headset and a car telephone handset . . . and either beats the heck out of expecting to hear traffic sounds over some car audio systems, which are up there in hearing loss levels. Let's check the state car laws and get 'em cleaned up if they are out of touch with technology . . . Wayne

Dick Banter KB7DKT: What is needed is more how-to material. Something like your CB to 10m articles, but covering 6m, QRP and so on. It's a hassle to get all the parts.

We're trying to get as many projects as possible backed up with parts kits such as those from Ramsey and A & A Engineering . . . Wayne

Lawrence Guerrera NX2V: OK, Wayne, here goes. This is the first time I've ever written to a magazine, but I feel compelled to say: I agree with everything you have said in your editorials and I enjoy them! Now the bad news. In my area there is a ham club which meets every two months. Why? Most of the members are old-timers and have nothing better to do, so once a month is out of the question. What are they doing in terms of getting new hams into our ranks? Nothing, as far as I can see. Is no-code the answer to all this? Absolutely not! Am I for no-code? Absolutely yes! And I'm one of those hams who did it the hard way, from Novice to Extra step by step.

Matt Burgess WA4JDY: I used to think of you as that proverbial doomsayer in New Hampshire, a sort of crackpot with a ham ticket. I owe you an apology. I have begun to realize that all the things that I thought were baloney coming from you were right on the money. I dug out the last year of *73* and reread every one of your editorials [*Gasp! . . . Wayne*]. You are hitting the mark a good 95% of the time. Please keep it up. I am busy trying to get other local hams to check out your ideas and give them a chance. Obviously nothing else has worked over the past decade, so what have they to lose?

Richard Davis W9KK: I've been in radio and electronics since 1938 and have experienced most of the things on which you've commented. I've seen a lot of changes and I've had to change constantly to keep up with the advances. The military services and the US government are changing, too. They are not teaching, wanting or using electronic technicians as we knew them. They are going toward circuit board replacers.

James Arconati KE0QU: I remember when you talked about FM and repeaters, and I thought, "Maybe there will be a few users who are interested." I modified a T43 and watched as the whole nature of VHF amateur radio changed. You started telling us about personal computers and the opportunities there. I bought an Apple II and had a ball, but missed the dollars I could have made. When you said satellite TV was a winner, I was already building an earth station, but I wasn't ready to follow your advice and make some money. Through the years your ideas have taken a few energetic individuals to new heights of success. Your own efforts have certainly changed ham radio and many areas of the electronics industry. Your offer in the March issue hit me at the right time.

Richard Ashley N5IZC: I'm in agreement on license fees. Few hams realize how much a few dollars would probably help the FCC take a bit more notice of amateurs and think us less a nuisance. If you can spend hundreds or thousands of dollars on transceivers and antennas, what's a few bucks for a license? If you want something, you should be willing to pay a little for it.

Steve Smith WA6SOC: Thank you for your magazine! Otherwise I would assume that ham radio is really as outdated and boring as most of the on-the-air conversations are. You are correct about RTTY and packet being where the action is. One reason is that these modes require us to compose our thoughts and reiterate them in a logical manner (something you don't find too often on 75m phone). Re getting newcomers, many people I invite into my shack are either frightened by the complexity of the equipment or unable to muster any enthusiasm for such an arcane hobby. I wonder if the code-free license would even have any takers? Keep up the good fight. Some of us actually do care.

Subscription problems do occur, accompanied by highly irritated letters from the injured. Let me spell out the facts of magazine life in the '90s. When I started 73 in 1960 the subscription rate was $3 a year. If we'd kept up with inflation that would be about $60 a year now. Instead, we use the best fulfillment service we have been able to find (in Colorado) and have been able to keep our rates to under $20 through automation and computerization. This means much less customer service and the frustrations of dealing with a computer when you don't pay on time, send a slightly wrong QTH, etc. If you send the $60 we'll personally handle your subscription, just like we did 30 years ago. Otherwise, if a problem develops, be patient and we'll eventually get the confounded computer system working for you. I see another huge postal rate hike coming, so obviously subscription rates will have to go up again. I really hate what they've done to foreign postage . . . which used to be very reasonable and now is absolutely ridiculous . . . when, oh when, will Congress allow private competition into this stupefying mail monopoly? . . . Wayne

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Issue #357

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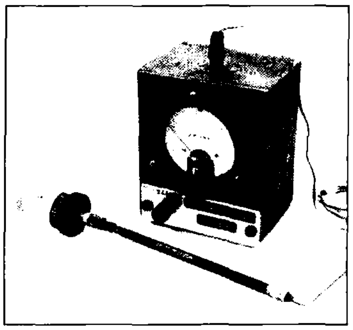
BOOK REVIEWS



Check your magnetic field! See page 34.

Cover by Alice Scofield

DEPARTMENTS

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Number 2 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1

220—Now What?

When the FCC took our 220-222 MHz away for UPS, the big deal was that UPS would be using an amplitude compandered SSB narrow-band system. I said baloney. ACSSB has never worked worth a hoot, despite tub-thumping *QST* articles on it... and even a section devoted to it in *The ARRL Handbook*. Sure enough (snicker), UPS hasn't been able to make it work and is reported to be turning to NBFM. This has got to be enormously embarrassing for whoever in the FCC did the spaghetti job on the rules when they took the two MHz away from us and then got the new commissioners to stonewall the situation.

I suspected something had gone seriously awry with the UPS deal when the FCC started frantically looking for something else to justify taking our band... like an emergency locator transmitting system (ELTs) for hikers.

No-Code—Again? (Ho Hum)

The FCC has again (sigh) proposed a no-code license (RM9055). Well, to be just a tad more accurate, they've moved the recent ARRL no-code petition fairly intact into rulemaking. Should I gloat? Nah... but I can't help grinning smugly. And wonder of wonders, since this was Invented Here (as opposed to Not Invented Here... NIH), I doubt the League will cudgel their member clubs to rise up en masse in horror this time... the tactic which so thoroughly defeated the last FCC no-code try. You've probably already forgotten about that, right? In another year it'll never have happened.

By now you should know my no-code opinions, but you probably don't. I explain them at hamfest talks and amaze hundreds of listeners when I repeat what I've written so many times in my editorials. Ask me what I think about no-code. OK, lucky you asked. I think a no-code license which appears to offer some real benefits to beginners will make it easier to get new hams licensed... but only after we've managed to attract them to our hobby.

The ARRL/FCC proposal sure doesn't offer much. The proposed Communicator license would be good only above 222 MHz. The good news is that all future newcomers won't find many hams to talk with way up there. What few are there generally use those bands for remote repeater control or linking, and would likely welcome Communicators like a new case of intermod. We're talking hostile territory, with very few friendly natives. Just what we need to encourage the newcomers to our great hobby.

So other than having to buy ham gear which will be of little use when they upgrade their tickets, having no one much to talk with, and being restricted to short-range contacts, what benefits do we have to offer Communicators? Remember, this'll be the only entrance path to the hobby. That ought to quickly cull out 99% of those dumb enough to bother getting a license. We may be able to cut down on the present pathetic trickle of newcomers even further this way.

If the ARRL's secret agenda was to finish off what's left of amateur radio, they could hardly have come up with a better rulemaking proposal... nor submitted it at a better time.

But let's say that, as usual, Wayne is dead wrong. Let's say that the Communicator license does offer enough fascinating operating to keep newcomers coming into the hobby and that, encouraged by the fun they're having on our UHF bands, they do eventually learn the stupid code and upgrade. Let's say that they don't bog down almost totally as the Technician Class has. Let's say that for some reason which is completely unimaginable to me right now, they do upgrade... what do we have then?

Unless we are somehow able to attract youngsters to the Communicator license, we won't be much ahead of where we are right now. And that means we are going to have to make the biggest basic change in amateur radio in history. We're going to have to start advertising and promoting our hobby... selling it to youngsters like any other product. This means building our visibility so youngsters will be aware that amateur radio exists. It means mercilessly promoting it in every available medium.

We sit grumbling because our kids are playing with computers instead of hamming. Gee, how did that happen? Well, it wasn't God; it was good old-fashioned advertising and promotion. It's called marketing these days. The computer companies are spending tens of millions to make sure that kids are playing with Nintendo and computers... and we're spending zilch or less to sell 'em amateur radio. Tell me money doesn't talk.

Sure, ham radio is a nonprofit hobby. Well, fine, we're going to nonprofit ourselves right out of business. Nintendo and the other computer games don't hold a candle to the fun of amateur radio. Worse, hamming used to get 80% of our newcomers into high tech careers. What does Nintendo prepare kids for, other than McDonalds table wiping? Thank heavens the minimum wage has just been raised!

If we ever do decide as a group to make an effort to take advantage of the PR opportunities which are open to us, we'd better have an attractive no-code entry ticket available, not the proposed Communicator Class. I'd sure like to see it with at least the Novice phone privileges.

We have ham moles in radio and TV stations everywhere, so we could get tons of free exposure. What we lack is an organization to generate the material. What little has been done so far has been absolutely terrible... more a turnoff than a turn-on for newcomers. Every time the ARRL has invested big bucks in a PR video, they have been unable to prevent themselves from turning it into a self-congratulatory epic instead of a commercial selling the benefits of hamming. Sure, we hams love to see videos telling us how great we are. But kids need to see videos on how they can have fun, not how a few obviously wealthy hams are enjoying talking with the world from their zillion dollar stations. Wrong message.

Since it would be substantially more difficult technically than the Novice test, the proposed Communicator Class license exam would be like starting out as a Tech, only without that dreadful 5 wpm code requirement. How much would the added technical requirement tend to inhibit newcomers from getting this license? The only difference between the Tech and the General license is code, so essentially we'd have beginners starting out on an equal footing with Generals, except that their code skill lack would prevent them from using the normal Novice, Tech, and General bands. Wouldn't this disparity tend to put more emphasis than ever on the perceived importance of the code as an obstacle? Yet the basic reason this new license was proposed was in recognition of code's irrelevance to commercial and military communications in the '90s. There's something gone really wrong with what's happened as opposed to what we desired and expected.

How About...

The proposed Communicator license does have the benefit that it would replace the Novice and Tech licenses. Well, almost. There's a proposed /AC suffix for Communicators who pass the 5 wpm code test. This will permit them to use the Novice and Tech bands. Talk about waffling, good grief!

With the hobby gradually withering away, perhaps it's time to shuck off the kluge structure that's been jerry-built for us. I like the idea of combining the Novice and Tech licenses. And, to my mind, the 5 wpm code test is only two or three hours of effort away from no code test at all, so what's all the fighting about? Let's make the entry license no-code and, as with the proposed Communicator, give the Tech level test.

Our Advanced Class is left over from the old Class A. Let's combine it with the Extra, and be done with it. We don't give the Extras all that many additional frequencies, anyway. That would give us about 150,000 Advanced/Extra Class licensees. Let's just call 'em Advanced Class... and keep the code requirement at 13 wpm. Remember, even the ARRL agreed in their Communicator petition that the code isn't as important as it used to be.

Then, if we lump the General and Techs together... again, the only difference between the classes is the code requirement... and add in the Communicator which is also technically equivalent, and we'll have a new General Class with about 220,000 licensees. That'll get us down to three classes, with about the right number per group. 90,000 Novices, 220,000 Generals, and 150,000 Advanced.

It's the old Keep It Simple (KISS) approach. Haven't we suffered enough from our caste system? What do we think we are, India? And look at the mess castes have made there!

Where's NIAC?

My original intention was to try and get the ham industry to cooperate in order to build a small National Industry Advisory Committee which could work with the FCC toward rebuilding our hobby.

Two problems came up. One was the almost complete lack of interest on the part of the ham industry in supporting an advisory group. Fewer than 25 of the over 750 ham industry firms volunteered to help... a matter of investing $100. The other was President Bush's incredible delay in appointing new commissioners.

The last of the new commissioners had just barely learned where their offices were when the Communicator

Continued on page 80

QRX . . .

EDITED BY LINDA RENEAU KA1UKM

SatelLife Packet

Lack of timely medical information is a leading cause of death in the developing world, according to global health experts. SatelLife, a not-for-profit organization based in Cambridge, Massachusetts, and Moscow, is working to correct this problem by using PacSats, low-altitude store-and-forward satellites, and briefcase-size packet ground stations. With a ground unit costing about $2,000, a health worker in the field can receive and transmit instructions, consultations, and messages.

Following the December 1988 Armenian earthquake, SatelLife facilitated the delivery of packet radio equipment to disaster workers, helping locate more than 6,000 people. In 1989 a SatelLife healthlink was established between medical workers from Moscow's Ninth Children's Hospital and specialists from the Shriners Burn Institute in Boston. This link, in cooperation with the San Francisco/Moscow Teleport, is now allowing American burn experts to consult with Soviet physicians on the treatment of young victims of a recent Soviet train wreck.

Most recently, SatelLife has agreed to provide direct satellite transmission of urgently needed medical information to Polish physicians, according to Executive Director Dr. Charles Clements. This is the first medical information retrieval service to use direct satellite transmission. SatelLife will provide the Central Medical Library in Warsaw with USATs (Ultra-Small Aperture Terminals) first, and eventually provide each medical academy and institute in Poland with them. The USATs, connected to FAX machines, will receive medical data from the privately owned Pan-American Satellite-1. Microspace Communications, a subsidiary of Capitol Broadcasting Company that has donated three years to this project, will provide transmissions to Europe and the US.

The one-year-old organization, overseen by an international board of distinguished scientists and physicians, is in daily contact with its office in the Soviet Union. Through a 1987 agreement, the Soviet Academy of Sciences will launch SatelLife's satellites free of charge. For more information, call (617) 661-6468. *TNX Sharyn Cooper, Cudaback Strategic Communications, 11-B Mt. Auburn St., Cambridge MA 02138.*

Dove Crisis Averted

Last March 14, AMSAT learned that the DOVE Microsat on-board computer had crashed; The DOVE transmitter was in a key-down condition, blocking the uplink command channel. This inhibited the normal on/off cycling of the transmitter. Only a carrier with minimal packet data was being sent on the 145.825 MHz general downlink.

On March 17, Dave Blaschke W5UN and Microsat guru Bob McGwier N4HY helped solve the problem. N4HY owns what is believed to be the world's largest private 2m antenna, which he uses for moonbounce operation. He transmitted a reset command sequence to DOVE, his 32.5 dBi array providing nearly 2 MW (megawatts) EIRP.

AMSAT members carefully restored control of the spacecraft at the optimum time in the battery cycle, and commanded the S-band transmitter on. Telemetry from the S-band downlink will be analyzed for clues that might help in understanding the circumstances surrounding the software crash. DOVE controllers advise that the 145.825 transmitter will be off the air until new software can be loaded.

The DOVE (Digital Orbiting Voice Encoder) concept was formulated by Dr. Junior de Castro PY2BJO of Brazil AMSAT (BRAMSAT). It was inspired by the educational use made of the Russian-Canadian Skitrek operation carried out on UO-11 during the Winter/Spring of 1988. The idea was to produce a satellite capable of transmitting synthesized voice and common digital modes in a widely available frequency band, such as FM. *TNX W5YI Report and QCWA Journal.*

What's Happening to 220?

The United Parcel Service may be on the verge of dropping ACSSB (amplitude compandered single sideband) and going to FM in its recently purchased 220 to 222 MHz. II-Morrow, the UPS subsidiary building the ACSSB gear, is having trouble making it work properly. Reportedly, the pilot tone that locks the system will not accept a 200 cycle drift. Rumor has it that II-Morrow may soon announce that the radios will be FM with 2.5 kHz channel spacing.

One of the primary reasons the FCC gave for reallocating 220-222 MHz to land mobile was for its use in development of new, narrow band technologies. If they end up using FM, a congressional investigation of UPS, II-Morrow, and the whole procedure used in transferring the spectrum might well be in order. *TNX Watts New.*

Romania: Ham Gear Needed

Hams in Romania need donations of amateur radio gear to get their nation back on the air. After the revolution, it became apparent that most of the amateur equipment in Romania had been destroyed. They need practically everything, from working radio gear and transformers to parts and components, and even coaxial cable.

Responding to an appeal from YO3CD, Alec Allen GM5VS of Amcomm Corp. has offered the organization's London location as a central collection point for donations. He will also arrange for transportation of the donations to Bucharest.

Any contribution must be *well-cushioned* to prevent damage in shipping, and securely packaged. It must also include a OSL card from the sender, to permit a return card from the recipient. All packages will be passed unopened, except possibly by customs inspectors.

Send donations to Romanian Appeal, Alec Allen GM5VS, %Amcomm, 373 Uxbridge Road, Acton, London, WR3 9RH, United Kingdom. *TNX Amateur Radio Newsline.*

Don't Get Zapped!

Lightning is lightning, but is it the same everywhere? No, it isn't, according to Richard Orville, an atmospheric scientist working at the State University of New York in Albany. Orville used a satellite network of detectors to analyze lightning along the East Coast in 1988. His findings were reported in the January 1990 issue of *Nature*, and later in *Horizons*, a newsletter from Best Power Technology, Inc.

In a study of five million lightning strikes, the average current in a Florida lightning bolt was 45,000 amperes. In comparison, New England lightning bolts averaged "only" 25,000 amperes. To put this in perspective, the average home uses a 200 amp service for the microwave, TV, heating and cooling systems, electric stove, and garage door opener.

The Tampa, Florida, area has been known as the "lightning capital of the world." There, according to the US Weather Service, storms produce an average of 1,300 strikes a day during the summer thunderstorm season.

As many hams have discovered, knowing the properties of lightning and how to protect yourself, other people, and your equipment, is an important topic. *TNX to Paul Marshal K4AVU.*

ARRL to Fight for Novice?

In PR Docket 90-55, the FCC proposes abolishing both Novice and Technician Class licenses, and replacing them with the Communicator Class license. The ARRL says that this proposal differs substantially in philosophy from what the League had envisioned. In the February 1 edition of the *ARRL Letter*, Executive Vice President Dave Sumner K1ZZ noted, "While the League will not have an official position on the FCC proposal until one is adopted by the Executive Committee or Board, it is fair to say that we have long placed great importance on the. . . Novice license as a means of entry into amateur radio."

Sumner said it wouldn't be an overstatement that in the past as well as in the present, the League deems the Novice license as essential, but he cautioned that the amateur community might want to wait and study the entire text of the FCC's no-code license proposal before taking a stand.

Sumner did not mention any need to retain the Technician Class license. Most observers feel that the ARRL may use the Technician Class as a bargaining chip, but view the Novice Class as a non-negotiable must.

For the past few years, the Technician Class has been the fastest growing of all license classes, an unforeseen result of splitting Element 3 into 3A and 3B for Novice Enhancement. Indications are that in another few years, the Technician Class could become the dominant license class and weld the most political force in the amateur radio community. *TNX Amateur Radio Newsline.*

Ingenious Use for CW

In 1884, Thomas Edison, widowed and nearly deaf before age thirty, used his inventive genius to court and win his second wife, Mina Miller. He taught her Morse code so that they could communicate privately in the presence of friends, relatives, and Mina's younger, more handsome suitors. Even in the most crowded, noisy room, they could tap out private messages on one another's palm. This gave Edison an advantage none of the other suitors had!

Later that year, on an excursion in the mountains of New Hampshire with friends, Mina's family, and Edison's five-year-old daughter, Edison cut through the QRN with Morse and asked Mina to be his wife. She blushed as he eagerly waited for her reply, and tapped out "Yes." *TNX B-N-T Bulletin.*

Avoid Battery Mix-ups

Mixing alkaline and zinc batteries creates a pressure explosion when you connect several in parallel. The explosion is big enough to split the end cap of an explosion-proof flashlight and blow it off.

Of seven brands inspected, the Eveready Alkaline Energizer was the only battery incorporating a warning label about mixing battery types. Since it appears that major manufacturers are converting from carbon zinc to alkaline mix, the possibility of mixing battery types is increasing. To avoid this hazard, check your batteries. *TNX ESS-ZED Newsletter.*

Frequency Relocations

Novice, Technician, and beacon changes, possible and current! On March 1, based on petition RM-6594 by Bradley Wells KR7L, the FCC announced that it proposes to change authorized CW frequencies for Novice and Technician Class operators in the 80 meter band from 3700–3750 kHz to 3675–3725 kHz. Although at present Novices and Techs may only transmit CW in 3700–3750, Canadian stations use that segment for voice. Wells argues that this results in considerable QRM between US and Canadian stations, and that relocation would reduce interference in the 80 meter Novice segment. The FCC requests comments from the amateur community.

The FCC has amended its rules by relocating the frequency segments used by automatically controlled beacon stations operating in the 2m and 70cm amateur bands. This action is a response to an ARRL petition requesting that the beacon subbands be changed from 144.02–144.06 MHz to 144.275–144.300 MHz on 2m and from 432.07–432.08 MHz to 432.300–432.408 MHz in the 70cm band. The ARRL's request to relocate the 220 MHz beacon subband from 220.05–220.06 MHz to 220.275–220.300 MHz was denied. *TNX ARRL, Amateur Radio Newsline, and HALO.*

MIR Operations

Soviet cosmonauts Anatoly Soloviev U6MIR and Alexander Balandin U7MIR may have resumed amateur radio activity on MIR, the Soviet space station. According to AMSAT, reliable sources report that the cosmonauts are transmitting on 2 meters, primarily on 145.50, but they may also be found on 145.550 MHz. The most probable time of operation is after 18:00 UTC and anytime on weekends.

The report is that the new radio brought up by U6MIR and U7MIR wasn't functioning properly, and the cosmonauts were using the equipment left by U2MIR and U4MIR. It seems they plan to replace the nonfunctioning rig soon, possibly on an unmanned supply mission. *TNX AMSAT and Watts New.*

WARC-92 Committee

FCC Commissioner Sherrie Marshall and Francis Urbany, Director of International and Agency Relations, BellSouth Corporation, have been appointed co-chairpersons of the FCC's Advisory Committee for the World Administrative Radio Conference in 1992.

The Advisory Committee will counsel the commission on the preparations for WARC-92 and make and develop recommendations for the US proposals and positions on topics addressed at the conference.

ARRL Executive Vice President David Sumner K1ZZ has been named to serve as one of the 35 members of the FCC WARC Advisory Committee. Committee members, selected from both the business and academic communities, represent a diversity of telecommunications interests.

Waco Weather Watchers

If boughs are breaking in Waco, Texas, because of severe weather, chances are good the National Weather Service will be quickly informed by hams from the Heart of Texas Amateur Radio Club. Jim Lovett, the club's president, says, "The weather bureau's radar is very good, but to confirm what's actually happening, and for certain reports required by FEMA, they need visual reportings of actual damage, and that's what we do." FEMA is the Federal Emergency Management Agency.

The Waco radio club mans a permanent amateur radio station, installed in last January, at the National Weather Service facility at Waco Regional Airport. Before this station was installed, the club used the equipment of whatever radio operator was asked to go to the weather station, which sometimes caused delays as the operator fetched his equipment. Lovett says, "Quite often the connections were different, and we had a variety of different types of equipment. . ."

The radio operator on duty calls other radio operators who go to pre-established sites to watch and report on the weather. Up to 45 amateur radio operators participate. The hams also work closely with the Waco-McLellan County Office of Emergency Management. *TNX AP and R.A. Matias.*

RV Radio Net

The Good Sam RV Radio Net, covering most states and Canada, handles traffic for RVers on trips. The 400 members, who also belong to the National Good Sam Club, discuss RV problems and activities.

The net meets Monday through Friday at 10:00 a.m. EST on 7292 during the winter, and at 10:00 p.m. during the summer. You can check in up to 20 minutes before the hour. The net also meets on Tuesdays at 8:00 or 8:15 p.m. EST on about 3888.8, and Sundays on 14.240 at 3 p.m. EST.

Anyone interested is welcome to check in. For more information, send an SASE business size envelope to Jack Russell KG5IO, PO Box 207, Golden TX 75444. *TNX B-N-T Bulletin.*

Ham Help Survey

Thanks to all of you who responded to the "Ham Help" survey. Last December 1989, letters were sent to all the people who had had an entry in "Ham Help" during the previous eight months. The enthusiastic, often warm, responses we received reassure us that "Ham Help" is a valuable service for the ham community.

Of the 80+ people queried, only four reported no results. The rest received the help they needed, and some got more than they'd expected, such as new friendships, or reunions with old friends they hadn't seen for years.

"Ham Help" is staying in *73*!

TNX. . .

We appreciate your letters, newsletters, and calls. You can also reach us on CompuServe ppn 70310, 775, MCI Mail "WGEPUB," GEnie "MAG73," and the *73* BBS at (603) 525-4438, (300, 1200, 2400 baud) 8 data bits, no parity, one stop bit.

The Field Day Special— The "Ray Gun"

A Concentric Combo Mode B Antenna

by Jack Douglas KA5DNP

Several years ago I was invited to speak to a new local ham club, the Northwest Area Radio Society, about amateur satellite operations. This led to my joining the club, and soon our first Field Day activity was under way.

I took along the basics for operation on RS 5 and RS 7, the simplest way of earning satellite operation bonus points. After a while I heard the beacon from the best pass we were to experience, and then a beautiful "CQ Field Day" call.

At that moment, our HF CW station was changing operators. When the new operator came on I went running to ask for a 15-minute break in the CW activity, but to no avail. They simply did not understand that I had only 15 minutes to earn the bonus points and that their powerful CW signal was not kind to a high-sensitivity Mode A receiving system. Alas, no satellite operation that Field Day!

In 1988 I didn't give much thought to satellite operation at Field Day, but while I was at our site an idea hit. Maybe I could use the all-mode 2m in my car to hit RS 10/11. Then if a friend with HF in his car could pull up door-to-door with me, maybe we could make a contact. It worked! We made a good contact, but it could hardly be called a real satellite operation. Somehow we slipped this one in between CW calls from the "real" Field Day station.

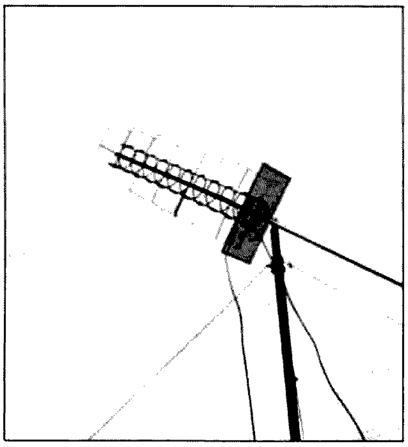


Photo A. The "Ray Gun" Mode B concentric combo antenna installed for Field Day operation. Note the string (horizontal line from the mount, lower right corner of the photo) used to adjust the elevation.

Photo B. The antenna installed at the motor home operating point.

In early spring of 1989 the club Field Day chairman called to ask if I would make a satellite effort for Field Day. I was noncommittal until a friend, Ken Edinborgh W5BKK, said we could use his radios if I could get an antenna set up.

I have operated on the high-flying birds (Oscars 10 and 13) for over five years using home-brew "Armstrong" operated antennas. Maybe I could construct a simple antenna system, thus avoiding the need for taking down someone's antenna system just for Field Day. This resulted in the "Mode B Concentric Combo," dubbed "The Ray Gun" by one of the fellows at Field Day.

What is the Ray Gun?

The Ray Gun is a 5-element 2m quad with a ten-turn 70cm helix wound inside it, concentric on an eight-foot wooden closet pole boom. The quad is an adaptation of information from the *The Satellite Experimenter's Handbook* and the 1986 *ARRL Handbook*. The helix is an adaptation of a design passed on to me by Jim McKim WØCY. (I used Jim's information to construct my home station 70cm antenna—the only 70cm antenna I have ever used!)

Photo A shows the Ray Gun in all its glory mounted at the Field Day site. (The thin horizontal line running to the right is the string used to vary elevation.) Photo B shows the antenna installed next to the motor home of Vince Hayes KCØLM, which was the operating point. Photo C shows the antenna in its "test mounting" (a rope thrown over my breezeway). We made sixteen contacts from the "test mounting" setup. Not too shabby, since elevation and azimuth weren't easy to change!

The Ray Gun is mounted on a 2" x 2" pole. A tie string handles elevation; azimuth changes are made by rotating the pole. With this setup our station logged 40 contacts on the Saturday night pass of AO-13, albeit with some difficulties from rains.

The advantage of the Ray Gun is that you only need to haul one antenna to Field Day, along with one small pole and some rope and tent pegs. The disadvantages are that there will be some desense because the two systems are so interlaced, and problems with wooden construction materials getting wet and reducing the efficiency of the 70cm helix. Note that I have referred to the antenna as a Mode B combo. This is because with the actual setup we had, be it antenna design or whatever, desense on Mode J was simply too great to allow operation.

I didn't have to buy anything to build this antenna—I already had everything I needed. If you want to build your own "Combo" I estimate you can buy everything for less than $50.00. An operational Mode B antenna for fifty bucks is not too common an animal!

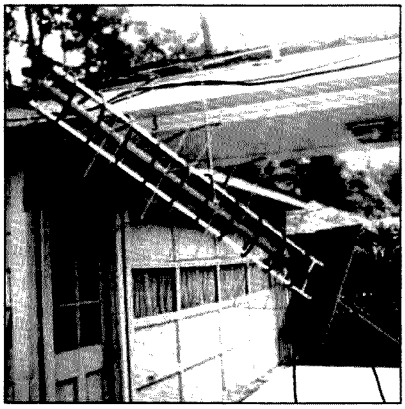


Photo C. The "Ray Gun" in its "test mounting" (a rope thrown over KA5DNP's breezeway).

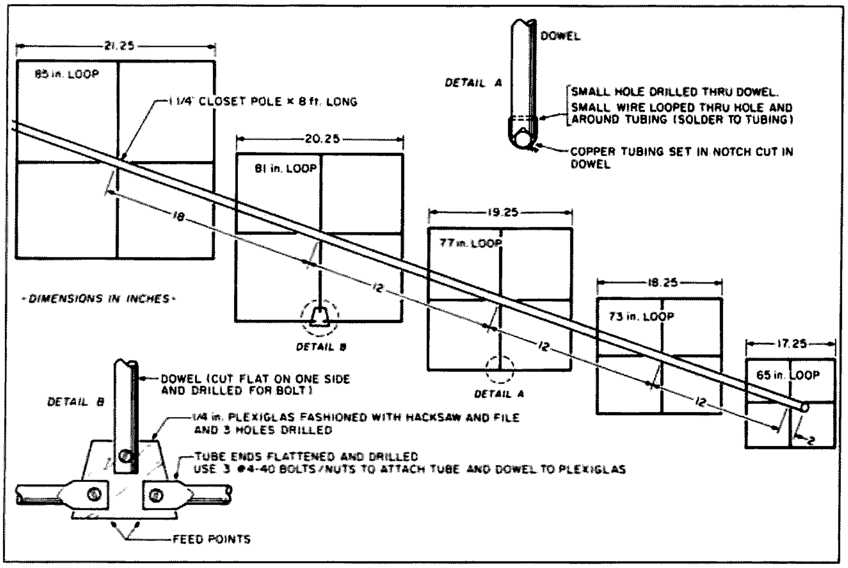


Figure 1. Constructing the 2 meter beam.

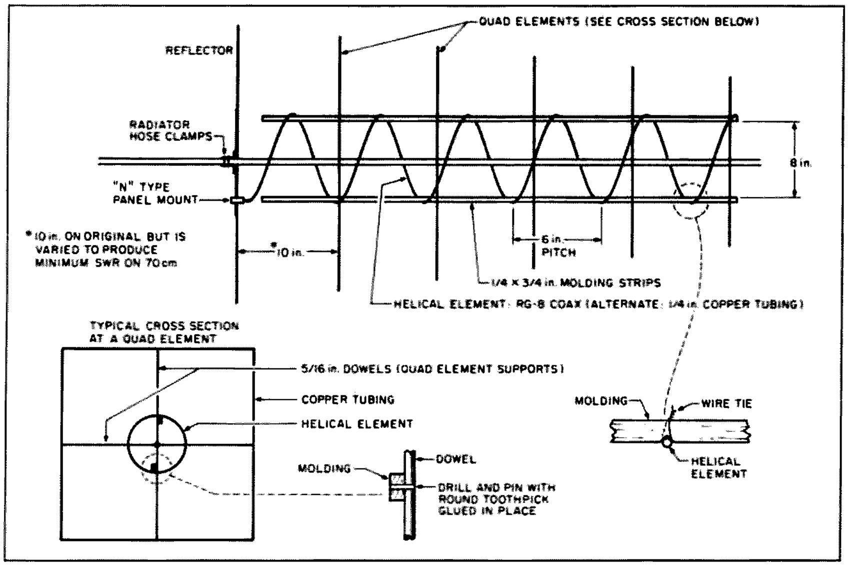


Figure 2. Constructing the helix.

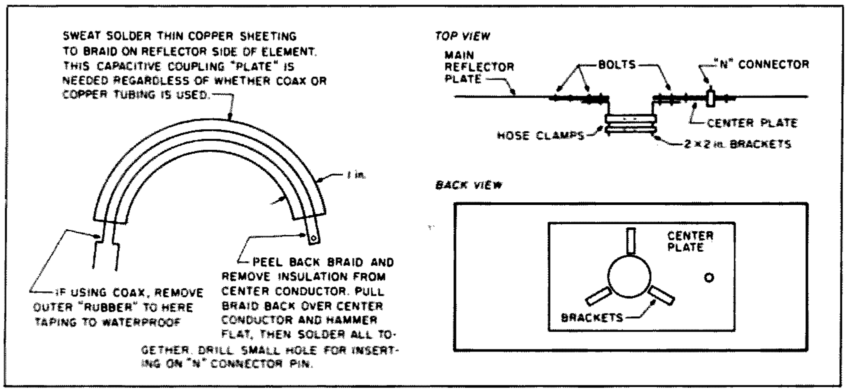


Figure 3. Final construction details.

Construction Details

I began by constructing the 2m beam (see Figure 1). The central boom is a 1 ¼" wooden closet pole eight feet long. (You can use less but it's nice to have plenty to work with.) The elements are squares made from 3/16" copper tubing (the tubing size is not critical). The element supports are made from 5/16" dowels. (Again, their diameter is not critical.) The insulator on the driven element was fashioned from a piece of plexiglas. The elements are connected to the dowel supports by the system Jim McKim WØCY used in his helix. (See Figure 1 for details.) The dowel supports are mounted to the "boom" by drilling 11/32" holes ½" deep in the boom. Fill the holes with fresh carpenter's glue and force the dowels into place.

The elements are not mechanically strong. I found it helpful and practical during construction to suspend the boom on small ropes thrown over the ceiling joists of my garage. The finished antenna is held up by a fitting on the boom. The mechanical integrity is more than adequate when supported in this manner.

The key element of the helix (Figure 2) is the reflector. The exact overall dimensions are not critical. To quote WØCY: "The helix is about the most tolerance-forgiving of any antenna." He used a 30" diameter circular reflector; I used a 24" x 30" rectangular reflector on my home base and a 14" x 27" rectangle on the Ray Gun because that is what I had on hand. However, I suggest you use something at least 24" x 24". A good source material is the design-punched aluminum sheets sold by most do-it-yourself stores for kick panels for screen doors. However, they are thin and you will have to brace them by bolting on flat metal or small angle iron strips, also available at local stores. The center area piece must be stronger. It can be made from an old aluminum rack panel or something similar. It should be 9" x 9", or a 10" circle (not critical as long as it is big enough to mount the 4" offset feedpoint). Bolt it to the larger reflector plate.

Refer to Figure 3 for the construction details of the next steps. Drill or cut a hole in the center large enough to allow the boom to pass through. (I suggest 1-5/16".) Place a second hole, to accommodate a panel mount "N" connector, 4" off center. Attach three 2" x 2" right angle brackets to the reflector at the edges of the center hole (at 120 degree angles). This can be done by drilling and bolting, using 6-32 bolts. The idea is to have the brackets placed so that when the boom is run through the center hole it can be secured by radiator hose clamps tightened around the brackets. Later you can "match" the antenna by varying the capacitive coupling between the first half turn of the helix and the reflector screen. The sweat-soldered copper on the first half turn facilitates this procedure.

When the reflector assembly is ready, set it aside and mount the helical element. Run strips of ¾" by ¼" molding parallel to the boom, with their outside edges 8" apart. (See Figure 2.) Lay them against the quad support dowels and hold them in place with C clamps. Use a small drill, sized to fit toothpicks, to drill holes through the molding and the dowels. Pin the molding in place by putting round toothpicks through the holes and gluing the toothpicks in place. Cut small notches in the outer edge of each molding at 6" intervals, offsetting notches on one molding 3" from

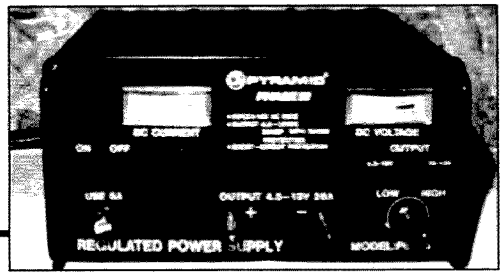
Number 5 on your Feedback card

PYRAMID SOUND
1501 60th St.
Brooklyn, NY 11219
Tel. (718) 436-1616
Price Class: $90

73 Review *by David A. Manson N1CTI*

Pyramid Phase III PS-25

Adjustable power supply.



This summer I was finally able to retire my tube rig and buy a clean, used ICOM IC-735, but limited funds precluded buying a matching power supply. So out came a recent copy of *73 Magazine* to check out the alternatives.

The supply I chose and the subject of this review is the Pyramid Phase III adjustable regulated power supply, model no. PS-25. I have also seen this supply under the Tenna brand name. The PS-25 was purchased for around $90, including shipping, and comes with a two-year warranty.

This supply, rated at 25 amps continuous and 27 surge over a range of 10 to 15 VDC, has separate front panel meters to display current and voltage. The ON/OFF switch doubles as the power ON indicator, and it goes out if the built-in protection circuitry detects an overload and shuts down the supply.

Straightforward Design

Set-up is quite simple. I used the mobile cable supplied with my radio to connect the supply to the rig. The combination binding posts and banana jacks on the front panel can be unscrewed completely to allow the ring connectors on the cable to be used without modification. After turning the supply on you can adjust the voltage as desired with the front panel control.

Initially I had some concerns that the voltage control might be inadvertently bumped, but the rack-type handles on the front of the supply protect both the ON/OFF switch and the voltage control.

The supply is enclosed in a metal enclosure measuring 9"W x 5"H x 12"D with black matte finish. All controls are located on the front panel, including the fuse holder. The quality of construction is quite excellent, and a schematic was included with the supply. The circuitry uses an integrated regulator chip with standard RCA 2N3055 NPN pass transistors.

The pass transistors are mounted on two large heat sinks on the rear of the cabinet, and have never been more than warm to the touch even after extended high current load (100 watts FM).

Due to the quality of construction, two-year warranty, and the discount price, this could be the best power supply buy of the year. I highly recommend it for the amateur on a tight budget. It is also excellent as a variable power supply for the test bench. *The PS-25 is available from National Tower Company, PO Box 15417, Shawnee Mission KS 66215. Phone: (913) 888-8864.*

Field Day Special, *continued from p. 11.*

those on the other molding. Just below the vertex of each notch, drill a very small hole to use for a wire tie.

Varnish all of the wood to waterproof it. When the varnish has dried, wind in your element, fitting it in the notches and tying it with wire ties to hold it in place. The windings should be clockwise when viewed from the back end, where the reflector of the quad is located. (This is where you will mount the helix reflector.) Leave both ends of the element long enough to allow room for forming end fittings.

If you're using coax, remove the outer insulation from the back end of the helical element. (See Figure 3.) Whatever is used for the element, sweat on a 1" x 6" arc-shaped copper plate (made from tooling copper or any kind of thin copper sheeting). Flatten the end (being sure the braid and center conductor are in electrical contact if you are using coax) and firm it with solder. Drill a small hole just large enough so that it can be slipped over the soldering tip of a panel-mount "N" connector. The outer end of the element should be cut off just past the last tie so that it is stable. If you are using coax, connect the braid to the center conductor and waterproof the end with tape and coax seal.

Now slide the reflector onto the boom and up to the point where the end of the element can be soldered to the "N" connector. Push it forward enough so that the first half turn (the one with the copper plate on it) is very close (about ½" to ¾") to the reflector . Slip two hose clamps on the reflector.

The Match

If you have the antenna suspended on ropes, and it is not too close to other objects, you can now test the match. The dimensions control the match on the quad. The actual match is not critical for Mode B because you will not use the antenna for transmission, but try for a good one because you might want to use your Ray Gun on Mode J.

> *"The advantage of the Ray Gun is that you only need to haul one antenna to Field Day."*

To match the helix, slide the reflector back and forth (closing and opening the gap between it and the first half turn of the element) until you get a match. It should be easy to get ratios below 1.1:1. When you have a match, tighten the hose clamps so the reflector cannot move. The antenna is now complete, but you still need to do some more work before you mount it.

Get six feet of 1¼" ID metallic EMT pipe. Depending on the actual finish on your boom, the EMT will slide over the back end or you may have to sand the boom down slightly. When it does fit over the boom, slide it up against the ends of the brackets holding the reflector. With the antenna suspended so that the feedpoint of the quad is on the bottom, drill a ¼" hole through the EMT and the boom, parallel to the ground and about six inches back from the front edge of the EMT pipe. Rotate the antenna 90 degrees and drill another hole two inches back from the first. A bolt through either of these holes will suspend the antenna. The hole you use will depend on which orientation seems to work best for you.

A wooden pole 2" x 2" 8–12 feet long can serve as the mounting pole. You will need a piece of 2" ID very heavy duty PVC about four inches long. By cutting the corners off the pole on one end for a distance of about a foot, you should be able to slide the PVC over it as a collar. It should shoulder at the end of the length where the corners of the pole have been cut. Three holes in the collar at 120 degree angles, fitted with small eye bolts, will provide places to tie on three pieces of light rope or heavy nylon cord. These can be run to tent pegs to hold the pole up, yet the pole can still be rotated to change azimuth. A hole through the top of the pole and a bolt long enough to go through the mounting holes on the antenna and the pole provide a single point mount for the antenna. The EMT should be cut off as necessary so that the front of the antenna will drop down when the antenna is suspended on the single bolt. Drilling a small hole in the back end of the EMT and running a nylon cord through this hole to a tent peg will provide a means of setting elevation.

Now you have a Ray Gun concentric Mode B antenna!

Contact Jack Douglas KA5DNP at 2019 Willow Point Drive, Kingwood TX 77339.

TNC Connect Alarm

Did anyone call while I was out?

by Mark Schmidt DA1AU/WB9EGA

Packet has brought hundreds of hams back into the fold of activity. We can pass emergency services traffic faster than we can generate it (try that with CW). Entire packet stations can fit inside a briefcase and be set up in minutes. For me, this mode was a way I could indulge in my two vices—computer and radio—simultaneously. I'm having a ball! 99.9% of my operation is packet.

The Problem

Like most stations, mine is in one room, and I didn't want to spend my free time sitting in front of the computer waiting for someone to call. I needed something which would signal me when someone connected. The TNC's "ring"(*) parameter sends three bells on a connect, but what if I wasn't around to hear it?

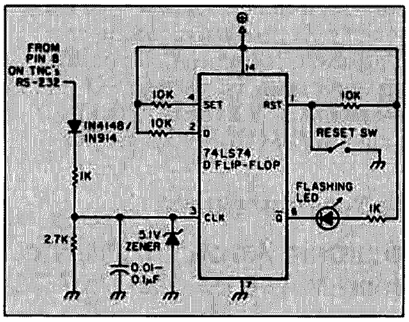
An Idea is Born

Browsing through the KPC-2 TNC manual in the section about the RS-232 port, I found on line 8, the Data Carrier Detect, that "when connections exist, the line will be true." Rereading it, I eventually saw the makings of a hardware connect alarm.

If unconnected, the line will be false (a minus voltage). If I connect to someone, or someone connects to me, it will be true (a positive voltage). When I or they disconnect, it goes false again. Armed with these facts, there are three things this hardware connect alarm will have to do for me: detect the transition from false to true, give me a signal if the status is true, and save the true status until I reset it.

The Answer

You can do it all with a single flip-flop. It must be positive edge triggered with an asynchronous reset. Although I haven't tried them all, several fit this requirement: the 7474, 74109, 74174, 74175, 74273, and the CMOS versions 4013, 4027, 40174, and 40175. Read the specs to pick the one that suits the inputs/outputs you want.



Schematic of the TNC connect alarm.

I chose the 74LS74 (low power Schottky version) D Flip-Flop. Construction details are based on the 7474. Although the 7474 contains two flip-flops, you need only one. If you find a use for the other one, let me know. The circuit I came up with is simple. The whole thing is very small; you can build it on a PC board 1½" square. You'll need +5 volts to power the 7474, but you don't have to add a battery. You can pick it off from the TNC's regulator.

RS-232/TTL Level Conversion

RS-232 signal levels can vary anywhere between −3 and −25 for false and +3 to +25 for true, so you need to convert the negative voltage to 0 and the positive to +5, the allowable limits of the 74xx TTL series. The diode on pin 8 takes care of the negative voltage and the 5.1 volt zener diode takes care of the positive voltage. Think of them as protection for the 7474.

Any negative voltage at the RS-232's pin 8 results in 0 voltage at pin 3 of the 7474, and any positive voltage greater than 5 volts is held to +5 volts. The Set and Reset pins are held high, as is the D input. When a connect occurs, the negative to positive transition at pin 8 of the RS-232 will convert to a 0 to 5 volt clocking pulse for the 7474. At that time, whatever is on the D input (a high) will appear at the Q output. Also the opposite (a low) will be at the ≠Q output. It will stay that way until the Reset (pin 1) is momentarily brought low. What could be easier?

The Signaling Device

Choose whatever you want for the signaling device. It can be visual, like a simple LED or even a strobe light, or something audible, like a buzzer, horn, or siren. Why not go remote and integrate it into a short range pager like I saw in the May 1986 issue of *73*. It's up to you. You are limited only by your imagination.

The Q and ≠Q outputs are low power, so if you intend to use a large device, use a relay.

Mounting

This unit is very small and easily fits inside the TNC. There's room on the faceplate to mount an LED and a reset switch. Tap into pin 8 from the inside.

Now maybe for some reason, you don't want to mount it inside the case. You're going to use a strobe light and siren, and you might as well mount the board someplace else. In that case, the +5 volts for the 7474 will have to be routed externally to wherever your board will be. While you have the TNC open, take a look at the RS-232 jack. You will see that many of the pins are unconnected. Solder a wire from the output on the 7805 regulator to an unused pin on the jack. I used pin 13. Now you have everything you need available at the jack: ground (pin 7), +5 volts (pin 13), and the status (pin 8).

CMOS Considerations

Although I have not yet made a CMOS version, there are a few things you should keep in mind. Since CMOS can operate at higher voltages than the 5 volt TTLs, you may want to use 12 volts to power the chip. It just so happens that 12 volts is already on pin 25 of the KPC-2. You don't have to reroute power to the RS-232 jack. Also, you may not need the 5.1 volt zener. Experiment and see.

Operation

Using this couldn't be simpler. When someone connects to you, or you connect to them, the alarm will be activated and stay that way until you reset it. But if you're running multiple streams, there's something you should be aware of. Let's say you're connected on stream A and not on stream B. If you are on stream A and change to stream B, you will change from a connected to an unconnected state; when you change back to stream A, what happens? You guessed it. The alarm will activate. It doesn't distinguish streams—it sees just a simple unconnected to connected state change. Other than this little quirk, which we can do nothing about, it works as advertised.

Parts cost me nothing since I had all the parts in stock, but everything new shouldn't cost more than $3 (excluding strobe and siren) and all are available from Radio Shack.

Four out of Four

This project uses common and cheap parts (two of the four requirements for any of my projects). Construction is fast and simple (the other two requirements). It'll give your packet operations a little something extra.

Packet is the best thing to happen to amateur radio in a long time. We're doing things unheard of on any other mode. Let's use it wisely, but most of all . . . enjoy! ■

Mark T. Schmidt DA1AU/WB9EGA, Box 1001, APO NY 09104. He writes, "Here in Germany, no-code is alive and well . . . CW is a mode, not THE mode."

Parts List

1	74LS74 D Flip-Flop	1	2.7k resistor
1	5.1 volt zener diode	1	0.1–0.01 µF capacitor
1	1N914/4148 diode	1	flashing LED
2	1k resistors	1	SPST switch
3	10k resistors		

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

Feedback # Title

Number 6 on your Feedback card

HAM PROFILES

There are no "average" hams!

Photo A. Sixteen-year-old Aaron Greiner KB0BDY stands between his father, Keith AK0Q, and his grandfather, Loren Greiner W0GTW.

Third Generation Ham

When still a child, Aaron Greiner KB0BDY began participating in amateur radio by watching his father. Eventually, the code "rubbed off" on him. The code test was easy, and with only a little study Aaron did well on the written test.

Says Aaron, "I love to get on the air and try for DX contacts using CW. One reason why I love to use CW so much is that I can tell my Spanish teacher that I really don't need to know Spanish to talk to someone in Spain because I almost always use CW instead of voice.

"I am currently a sophomore at Dowling High School in Des Moines, Iowa, and I'm very active on the soccer team. I'm also learning to fly remote controlled airplanes, and I carry a newspaper route for the *Des Moines Register*."

On his 16th birthday in January 1990, Aaron became the third generation of the Greiner family to achieve the General Class license. Aaron's grandfather, Loren, was the first Greiner to become a ham. He received his General Class license in 1947. Now he holds an Advanced Class license with the call W0GTW. Aaron's father, Keith AK0Q, has had an Extra Class license since 1984. He was first licensed in 1962 as a General Class operator.

Photo B. In addition to ham radio, Todd Tittle KF7LX enjoys fishing, horseback riding, waterskiing, and photography.

A Capable Ham

When Todd Tittle KF7LX was 14, he earned his Novice license, and within a year he had achieved his Advanced Class license. Tod's favorite part of ham radio is meeting new people.

Todd is another third-generation ham. His grandfather, W.C. Brown, Sr. W6ECO, would be delighted to see his great grandson's enthusiasm for the hobby. Bill, Jr. W6TAO, Todd's grandfather, has been active in amateur radio for the past 38 years.

Last July KF7LX was elected secretary/treasurer of the Western Country Cousin's net. At 15 years-old, he was the youngest of the 1838 members. (The election was close, and according to "Lee" Dedrickson WB7EZI who submitted this material, "...there were many unfavorable comments made by the losers who thought a person had to be on the verge of senility to handle the job. One such comment was, 'I don't trust young people.' Our answer to that was, 'Maybe we had better parents than them.' ") Seven months later, Todd had proved himself capable of an outstanding job.

Todd is also the Treasurer of the CUBS Amateur Radio Society of Sedro-Woolley High School. He and his fellow CUB members have placed first and second in the summer Field Day competition among Educational Clubs Class 1A (which includes high schools and colleges).

In his "spare" time, Todd maintains high scholastic standards, and enjoys fishing, horseback riding, waterskiing, and photography. He is a certified scuba diver.

(Lee WB7EZI would like to give this message to the old-timers: "Welcome and encourage the young people, or your nets will be as dead as you are already acting.")

Photo C. Gilbert Monroe AL7KU (right) of Fairbanks, Alaska, has an eyeball QSO with Joel Pinto PT2KU (left) of Brazil, at the latter's QTH. Sr. Pinto designed the T-shirts for the first 2m group in Brazil.

Goldmine of Ham Experience

Gilbert Monroe AL7KU, known to friends as "Gil," first became interested in radio in 1930 at the age of eight. His brother and a friend built a spark-gap transmitter out of a Ford Model T ignition coil. They used a "kitty-whisker" and galena crystal with the tuning coil wrapped on a round Quaker Oats box for the receiver. It transmitted about five blocks. Gil was deeply impressed, but "...it was 21 years later that I finally managed to get the code down well enought to get a ham ticket (13 wpm)."

AL7KU was first licensed in 1951 in Fairbanks, Alaska. At that time he worked for the Geophysical Institute at the University of Alaska doing research on radio propagation. He supervised a group who developed a wave-tilt method of determining earth resistivity. For many years now, Gil AL7KU has been a gold miner.

His major interest in ham radio is DXing, and his top enjoyment is eyeball QSOs with foreign hams. Each year he takes a three-month vacation to Central or South America. He has learned to speak Spanish very well.

Last February, Gil traveled to Brazil to meet Joel Pinto PT2KU, who was first licensed in 1949. In 1975 PT2KU set up the first 2m station in Brazil. AL7KU and PT2KU enjoyed reliving ham operations from the old crystal-controlled 6L6-807 rigs up through their present day computer setups. Gil AL7KU visited the LABRE QSL bureau in Brasilia and was able to hand-carry a three-inch stack of cards to the QSL manager in Anchorage, Alaska. Next winter, Gil will head for VK-land.

COSIN: The COmputer Student Information Network

High school credits for ham radio.

by Jozef Hand-Boniakowski WB2MIC

We've been hearing a lot of talk about the demise of ham radio and rejuvenating our ranks, but we don't hear enough about the accomplishments of amateur radio operators in this area.

Five years ago I escaped from the grind of living in New Jersey, moved to the Green Mountains of Vermont, and began working for Burr & Burton Seminary, a private non-sectarian high school in Manchester, Vermont. I already had 12 years' experience running a public school radio club, with 12-year-olds getting their Novice licenses and 15-year-olds getting their Extras.

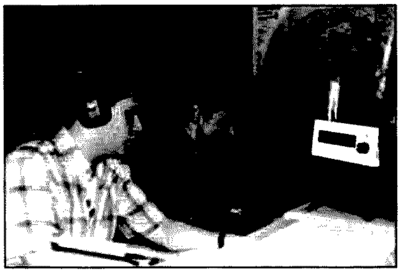
I sold my ham radio background and 22 years in amateur radio to the Burr & Burton administration as an asset that would enhance education. I called the press and a few articles appeared in the local papers.

The administration agreed to list the course as "Introduction to Electromagnetic Theory" in the school catalog, making certain that it was specified as amateur radio—a passport to travel, excitement, and friendly people—and clearly stated that students would earn credits toward graduation. The course would be open to everyone, with no prerequisites and no possibility of failure.

Luring Them

At the weekly Monday morning assembly at the school, I gave a short talk to the student body about one student's (Peter KA1RMN, now DL8KBQ) success at getting his Novice ham license. Then, having arranged for Ed Bort KT1Q to stand by his 2m rig, I pulled out my ICOM IC-32AT, held it up close to the microphone, and called him. He congratulated Peter over the air, via repeater, with an audience of 317 students, faculty, and guests watching! Talk about making an impression! (Fair warning: Test the public-address system beforehand. Nothing can be worse than RF causing problems with the PA.)

On another occasion, I recorded a dozen QSOs from stations that I had worked on HF. I made certain that these stations were spaced around the globe as far as possible. I asked each of the strongest QRM-free stations to pass along slowly, with good enunciation, a greeting to the school and a one-line description of the station's location and the transmitting ham's name.



Rob Putis KA1URY, Paul Donahue KA1URX and computer science teacher Jozef Hand-Boniakowski WB2MIC broadcast over the Burr & Burton Seminary's ham radio setup.

You can imagine the results! Chins dropped. Each student felt as if the hams in far-off places were talking directly to them. Then I described ham radio and how simple it was to get a special transmitting license to talk back. I built up the prospects of having a ham ticket as an asset, useful when applying for college or for jobs after graduation. That the applicant, in his or her spare time, studied for and obtained an FCC Amateur Radio License is impressive!

Catching Them

Most schools have a high-traffic area with bulletin boards. I took 40 QSL cards from different countries and made an attractive display, challenging the students to match the card with the country names below. This display passed along the excitement of talking with people in far-off places. Many students learned about rare DX places such as Bouvet, the Seychelles, St. Pierre, etc., that they'd never heard about before.

During the joint Soviet-Canadian Ski-Trek over the North Pole in 1988, I made 44 copies of the packet messages that arrived at the WB2MIC COSIN (COmputer Student Information Network) BBS, tracking the team's progress. I gave a copy to each teacher, administrator and staff member. I included magazine articles describing the expedition, AMSAT packet messages, and suggested school activities. I let everyone know that there was a ham radio satellite, OSCAR-10, up there with a digitalker on board that they could listen to with a handheld or scanner. I arranged to be on hand to visit any classroom that wanted me and my HT.

Reeling Them In

I teach Computer Science, Science 9, and General Math. The school's ham shack is located in my computer room. There are eight IBM Model 25s, one tied into an AEA PK-232 multimode controller. The HF radio is always available during homeroom period, between classes, or after a programming assignment has been completed. There is also an R2000 general coverage shortwave radio. "Listen for yourself to Glasnost," I challenged them. "Do you have a report to do on current events or contemporary problems? Tune into the 'Voice of that Country' and roll the tape recorder." During Mission 32 of the Space Shuttle *Columbia*, the R2000 was running full-time in the background, copying WA3NAN from the Goddard Spaceflight Center. Dozens were exposed to communications, SWLing and ham radio daily during the duration.

I let the social studies teachers know that all this is at their disposal. At the hamfests I look for used equipment, such as old Hallicrafters or Nationals, and sell them to the teachers at cost.

The most luck I have with ham radio in the classroom is with packet radio. COSIN was five years in the making. It consists of a BBS located at my home QTH in Wells, Vermont, a digipeater located atop Northeast Mountain to cover most of eastern New York and west Vermont, and a desire to make packet radio the new "pen pal" medium. On behalf of any student, an amateur may send a packet message all over the region or the country. We do this quite often, as messages addressed to "ALL@ ALLBBS." Some students are interested in corresponding with other kids in a foreign language, others are seeking out Holocaust

survivors, and some just want to reach out to others.

Through packet BBS I met Brian Riley KA2BQE, author of the impressive PRMBS (Packet Radio Mailbox System) ROSERV-ER. (I highly recommend this software if you want to run a BBS, especially if you wish to use it in a school.) Brian's original message, "Where have all the brains gone," caught our attention. I opened access to the BBS for the student body so that they could meet Brian via packet.

Brian is a Vietnam Marine Corps veteran, wounded in action. His stubbornness and a lot of luck accounts for him being alive today. Brian asked if students would be interested in interviewing him about his prewar, combat, and postwar experiences. Many have taken the opportunity. Ham radio via packet offered the youngsters the opportunity to preplan their questions and ask them anonymously (if they choose to) in non-real-time, without apprehension.

Carrying the Torch

As hams and educators, it's our responsibility to take the initiative and make inroads to and with our youth. Excitement rubs off. So do apathy and boredom. There are dozens and dozens of ways to express our excitement over our hobby to young people. We have to be creative in our approach. I have barely begun to mention the possibilities. Some other ideas I have tried or contemplated include: a suitcase packet station that travels with the environmental studies class (relaying data for computer analysis back to kids in the classroom), a statewide (or nationwide) on-the-air chess tournament via ham FS and SSTV, and a model rocket club using ham radio for coverage the way Walter Cronkite did it in his best days. Incidentally, Walter is now a ham!

The ARRL has recently renovated the W1AW club station, purchasing Harris commercial equipment. Instead of spending thousands of dollars for such an extravaganza, the League would have been better off equipping a few vans with roving ham gear. They could have hired teachers for full-time travel, like NASA does, to hit the road and give daily assembly presentations during the school year. Imagine hamming all day! Teaching! Traveling! The assembly presentation would have quick-setup OSCAR-13 ground stations, FS/SSTV and impressive Tesla coil demonstrations, spark-gap transmitters, etc. You could even string a dipole for 10 meters and bring out a small portable exercycle with a volunteer pedaling to produce 12 VDC for a Uniden HR-2510 and another volunteer QSOing at the mike.

My next project is to get a 220 MHz novice repeater on the air for use by students and adult hams interested in talking with students, learning new topics, discussing new ideas, debating contemporary issues, etc. I have approached the local business community for funding, mentioning that ham radio with student participation will "offer" the community a "service" by the installation of the repeater. I then ask if they are interested in helping fund the project in return for services rendered. (To those of you who object by saying that this is "business," I say "bull feathers." It's no different from a club newsletter asking for funds to help finance a repeater.) So far, most of the contributions have come from non-ham sources. The hams are still saying: "Can't do."

Think about the educational uses of a repeater. Teachers could have ham radio coverage of their classes for those who want to return to school! How about a question-and-answer session between the governor and a social studies class on a wide area coverage repeater, or a weekly net session by a retired person who is knowledgeable on a particular topic? Approach your local school with such prospects. You'll be surprised at how receptive the administration is and how successful you can be.

Ham radio is a way of life for me. As are kids and education—the two are best of friends. With a little effort the hobby can grow and the US will see a new pool of engineers and scientists who are excited about future technological prospects. It is up to us, the nonmembers of the "Silent Keys," to keep ham radio from seeing itself on that list. 73

Contact Jozef Hand-Boniakowski WB2MIC at RR #1, Box 1010, Wells VT 05774.

73 Review

by Angelo J. Polvere KA9CSO

FCC Study Diskettes

For MS-DOS computers.

Diamond Systems, Inc.
PO Box 48301
Niles IL 60648
Tel. (312) 763-1722
Price Class: $40, Novice tape.

Put together the wide proliferation of personal oomputers and the desire to attract young people into the hobby of amateur radio, and you come up with the study courses on diskettes offered by Diamond Systems, Inc., of Niles, Illinois. You don't have to be young or a computer whiz, however, to make good use of these study courses. The young, dynamic leadership of this software company, who also provides instructional material for other fields, such as aviation and paramedics, has designed a course which is user-friendly, effective, and best of all, is a lot of fun.

The diskette comes in a sturdy box containing an easy-to-follow, well-written explanation for use on computers with the MS-DOS operating system. Each course provides all the information necessary to take the FCC test for which it was prepared. The Novice Edition contains a theory section and a code practice section.

The theory section includes over 370 questions taken from the latest release by the FCC Volunteer Examiner Program. These are the actual questions and multiple choice answers you will find on the tests administered by Volunteer Examiners. The code section permits the student to select his own code speed and to shape the characters to his liking. For example, even though the code speed of 5 words per minute is chosen, the characters can sound as if they were sent at 13 wpm. This enables the student to upgrade his speed capability more easily.

The theory menu contains a list of subjects for the student to select from, such as Rules and Regulations, Practical Circuits, and seven other categories. The user can generate a typical 30-question test, choose random questions on a subject, or select questions from the entire database. Each question appears on the screen with four multiple-choice answers. The student can either select what he thinks is the correct answer, or he can request help. The help screen gives a detailed explanation of the question, in which is contained the correct answer. The student then returns to the question screen and selects an answer.

Score is kept by the computer, and the screen shows the number of correct and incorrect answers, and the number for which help was requested. Results from each training session are kept on the diskette in a separate file for each individual student, so that more than one member of a family or club can use the same diskette. For later training sessions the student can review questions missed on the previous session, resume where he left off, or select new random questions.

Answers are greeted with encouraging remarks on the screen, such as "no way" for an incorrect answer or "good going" for the right one. The variety of these remarks is such that it holds the attention of the student like a game.

Other features include the ability to print code practice and to adjust the tones for one's hearing preference. The Code section provides a number of practice QSOs, random characters or the ability to create a text file to your own liking. The entire course is fun to take, and even seasoned amateurs might want to give it a try to hone their skills or to just check up on their own forgotten knowledge.

I took the Novice test, and confess to not getting a perfect score, hi. With trepidation I intend to take the tests for the higher grades, which Diamond Systems also offers, even though I hold an Advanced ticket. Corresponding disk and diskette license courses for Technician, General, Advanced and Extra Class are available direct from Diamond Systems, or from Erickson Communications, Amateur Electronics Supply, Heath Co., and other amateur outlets, at affordable prices, and are well worth getting. ■

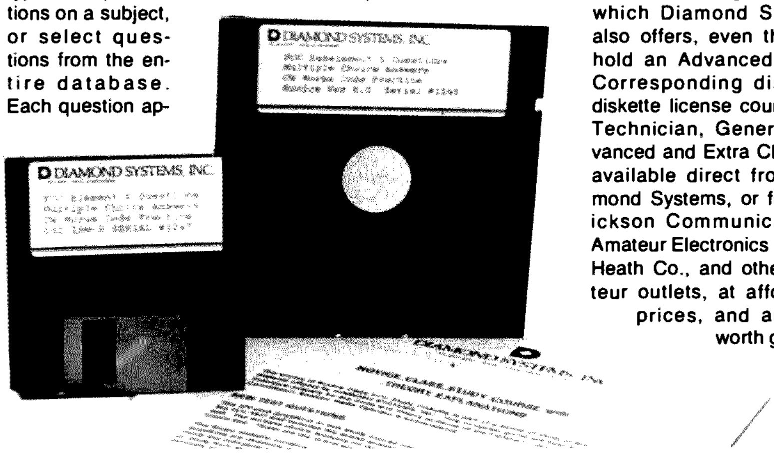


Photo. Diamond Systems offers its instructional material on both of the most popular disk sizes.

Big But Cheap!

Put a big signal on 40 meters for under $20.

by Bill Crowley K1NIT

Forty meters is truly a DXer's dilemma. There's plenty of DX to be worked, but you need more than a barefoot rig with a dipole. Big antennas and big linears require even bigger money.

I don't have big money so I set out to find an inexpensive solution. The criteria: The antenna had to be fixed-directional (preferably to the north to take advantage of polar F-layer propagation), it would hopefully have 3 dB points at least 30 degrees apart yet still produce some useful gain, it had to fit on my 55-foot tower and half-acre house lot, and it had to be **CHEAP**.

First up was a four-element log-periodic dipole array (LPDA) as described on page 21 of the August 1986 issue of *QST* ("Construct a Wire Log-Periodic Dipole Array for 80 and 40 Meters," by John J. Uhl KV5E). Everything I had ever heard about LPDAs proved to be true. They are difficult to tune, but if and when you hit it right, they provide tremendous results. The LPDA fulfilled all the parameters except that the beamwidth was extremely narrow, something on the order of 15 degrees when constructed according to the article. Since the front support for the antenna was a maple tree in the front yard (very hard to relocate for a better antenna heading) that meant I had a dynamite signal into Japan, and the rest of the world heard me better when I used my dipole. Time to look for a better solution.

The Path to Success

The solution came in the form of a cross between the LPDA and a good old-fashioned three-element yagi. I used absolute minimum spacing between the elements (0.1 wavelength) because at 40 meters even that covers a lot of space. However, if the boomlength is not a problem, you can get a slight gain improvement by wide-spacing the elements, and the elements will actually be shorter. See Table 1 for comparative dimensions.

The antenna is simplicity itself—three pieces of wire, which if purchased new at Radio Shack, should set you back less than $15! Add in another three dollars for insulators, and that's all you need.

Cut the elements in accordance with Table 1; note that the director and reflector are each one single piece of wire. The center insulator of the driven element on my version is a ceramic dogbone, because I happened to have one lying around. If you have a 1:1 balun, use it, or if you want to make a center insulator out of PVC, acrylic plastic, Bakelite or petrified wood, have fun. Anything will work.

I made the reflector and director center pieces out of ¼" acrylic, and then slid them on the elements and held them in place with liberal amounts of plastic electrical tape. Crimp-on connectors either side of the center piece would probably also work as well. Try to avoid solder because it can create a rigid area next to the centerpiece which could lead to physical failure because of repeated flexing when the wind blows. The "boom" is 3/16" nylon rope, but just about anything you have around the shack will probably work *EXCEPT* yellow polypropylene rope which deteriorates rapidly when exposed to the ultraviolet radiation in sunlight.

The secret to success for this antenna is to angle the elements forward about 30 degrees, à la the LPDA. This simple maneuver will add about 3 dB forward gain, the same as doubling your output power, and it won't cost a penny extra!

I used a 500-pound test nylon string to keep the elements parallel. Despite the misgivings of several local "experts," the whole antenna made it through a Maine winter with no problems.

My "dipole" is actually a trap "tripole" with two different length elements on one side of the balun to increase the bandwidth on 80/75. On 40, however, the elements are the same length. The performance figures for the antenna described here are mostly just observed estimates (that's one step above an educated guess) but from on-the-air comparisons with the dipole the forward gain seems to be in the neighborhood of 12 dB, the front-to-back ratio about 20 dB, and the front-to-side ratio about 30 dB. The beamwidth is approximately 35 degrees, giving reasonable coverage from Asia to Europe to the Middle East with its 355 degree aim point. Stations I can't even hear with the dipole are head and shoulders above the noise level on the yagi.

The antenna does have one disadvantage. When the rest of the locals come over to check out your new weapon, they'll probably drive right past your QTH the first time—everybody knows a killer array this good will be visible from miles away! So if you're tired of not being heard on 40 meters and the spare bucks are few and far between, give this $20 giant killer a try. You won't be disappointed. ■

Contact Bill Crowley K1NIT at RFD 1, Box 1589, Hallowell ME 04347.

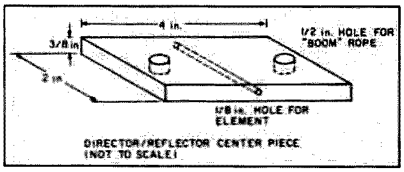


Figure 1. Director/reflector center piece (not to scale).

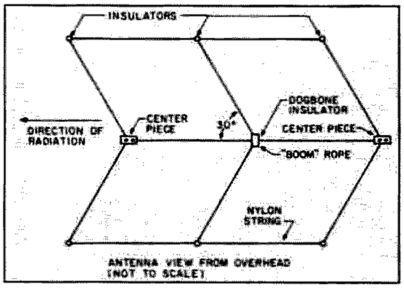


Figure 2. Antenna view from overhead (not to scale).

Table 1. Element Dimensions

0.1 wavelength element spacing:	**13.86 ft.**
Reflector:	70.42 ft.
Driven:	66.83 ft.
Director:	65.49 ft.
0.15 wavelength element spacing:	**20.79 ft.**
Reflector:	69.79 ft.
Driven:	66.48 ft.
Director:	64.79 ft.
0.2 wavelength element spacing:	**27.72 ft.**
Reflector:	69.01 ft.
Driven:	66.13 ft.
Director:	63.66 ft.
0.25 wavelength element spacing:	**34.65 ft.**
Reflector:	66.17 ft.
Driven:	65.19 ft.
Director:	61.69 ft.
0.3 wavelength element spacing:	**41.58 ft.**
Reflector:	67.61 ft.
Driven:	65.85 ft.
Director:	61.27 ft.

Note: Dimensions are calculated based on a design frequency of 7100 kHz, which should result in an SWR of less than 2.5:1 across the entire band, under most applications.

Materials

Quantity	Item	Source	Price	Total Cost
3	Antenna wire	RS 278-1329	$ 4.99	$14.97
6	End insulators	RS 278-1333	2/$0.69	2.07
1	Dogbone insulator	Fleamarket	$ 0.50	0.50
			Total	$17.54

Two Meter Portable Quad

Sturdy, easy to build.

by Charles W. Pearce, Ph.D. K3YWY

What I needed was a small, rugged 2 meter antenna I could use for various applications, including portable operation. Initially, I wanted to use it as a satellite uplink or downlink antenna without Az-El control, so I also needed a wide beamwidth with reasonable gain. I decided on a 2-element quad, running wire inside ½" PVC water pipe. The result was a sturdy, waterproof antenna.

To correctly size the elements, I used a test dipole to determine the velocity factor of #14 wire inside the PVC pipe. After plotting SWR versus frequency, I found the resonant frequency. Next, I encased the test dipole in the half-inch PVC pipe and repeated the measurements. The ratio of the resonant frequencies represented the velocity factor, which in my case was 0.98 for a dipole of #14 bare wire. Then I used the factor to adjust the size of the quad elements from their values in air.

Construction Details

The antenna is constructed from ½" white PVC water pipe and fittings. Table 1. lists the materials. Fig. 1 is a sketch of the driven element and reflector. Table 2. lists the pipe lengths for an antenna resonant at 147 MHz. You can change the resonant frequency by varying the long pipe lengths by ¼" per MHz and the shorter ones by ⅛" per MHz. Do not alter the spacer pipes.

To assemble each element, cut the pipes, then insert the wire through the pipe and fittings. Do not glue at this time. Keep the wire as taut as possible. Be sure to leave extra wire so that you can bring the ends out through the tee for the driven element. For the reflector, cross the wire inside the tee, and spot solder. The driven element is fed with RG-58 coaxial cable. No balun is used. Solder the inner conductor to one side of the loop and the braid to the other side, as far inside the tee as possible. If your solder connections are made outside the tee, the effective lengths of the elements are altered. It is possible to build the antenna this way if the lengths shown in Table 2 are shortened accordingly, but I have not constructed one this way myself.

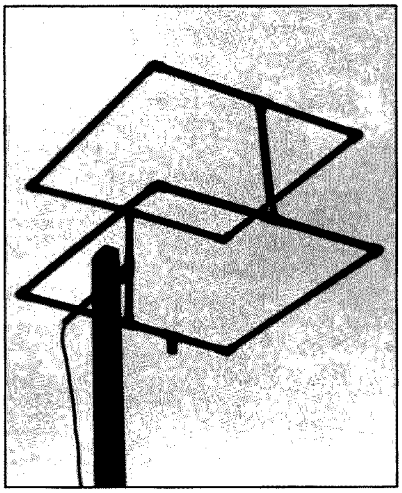


Photo. Easy to construct and versatile, this portable 2m antenna is also easy to mount.

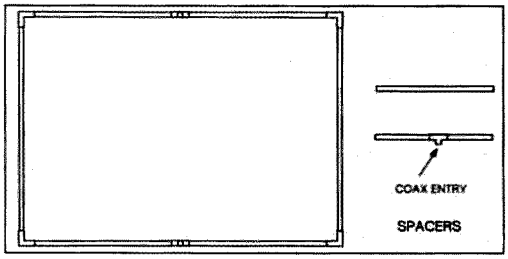


Figure 1. Reflector and Driven Element Layout

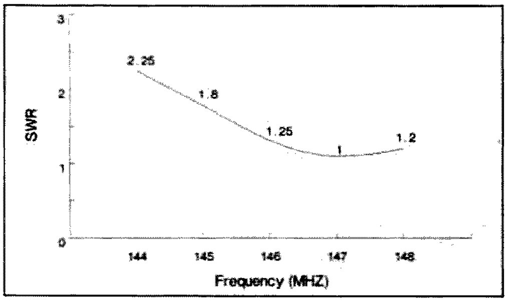


Figure 2. SWR vs Frequency

Assemble the antenna without glue, and check its SWR and resonant frequency. If the resonant frequency is high, you can lower it in the following manner: First, #14 wire with insulation decreases the velocity factor still further. The factor compared to bare wire was 0.97 (for the type of wire I used) as determined from test dipole measurements. Insulating the wire shifts the resonant frequency about 4 MHz. If you are high by 1 MHz, for example, keep three-fourths of your wire bare and insulate one-fourth of it. This would apply to both elements. If you are too low in frequency, trim the pipe lengths as previously mentioned.

Once you're satisfied with the antenna, unsolder the connections and disassemble the pieces. It's best to glue each element separately. Start at an elbow and glue each piece in turn. Do this on a flat surface to eliminate any twisting on the loops. Cant the tees in the driven element outward a few degrees and those on the reflector inward to account for the different loop sizes. The PVC glue sets up fast, so be careful to do everything right the first time. Make the solder connections as before, then assemble the two elements together. A little caulking or sealant should be used to seal the antenna where the coax exits the antenna.

Performance

The design frequency was 146 MHz, but the antenna actually resonated at 147 MHz, as you can see in Figure 2. However, the antenna is broadbanded enough so that this isn't a problem; the SWR is only 2.25 at 144 MHz. In actual use, as a vertical satellite uplink antenna, I have been able to access RS-10 out to about 20 degrees above the horizon, using 80 watts and a 50-foot RG-58 feedline. As a downlink antenna for OSCAR 13, it enabled me to copy Mode B using a 2 dB NF preamp at the receiver and the same feedline. Even pointed straight up, it allowed me to work all the local repeaters.

Summary

This antenna is inexpensive and simple to construct. It performs well, and gives long service. It is also an interesting learning project, as you gain insight into the concept of velocity factor. It should be easy to design a 3-element version. Although I can't guarantee the velocity factors, you should be able to use this construction method for 50 and 220 MHz. ■

You may contact Charles W. Pearce K3YWY at 410 12th St., Emmeus PA 18049.

Table 1. List of Materials

Item	Quantity
90 elbow	8
Tee	5
½" PVC pipe	16'
#14 wire	16'
PVC glue	as required
RG-58 coax	as required
PVC Pipe Lengths	

Table 2. PVC Pipe Lengths

Size	Number	Use
20"	2	Reflector
9"	4	Reflector
19"	2	Driven element
9.5"	4	Driven element
10"	1	Spacer
3.5"	2	Spacer

Number 11 on your Feedback card

73 Review

by J.S. Gurske K9EYY

PC HF Facsimile 4.0

Easy FAX reception for your PC.

Software Systems Consulting
150 Avenida Cabrillo, "C"
San Clemente CA 92672
Tel. (714) 498-5784
Price Class: $99.

Radio facsimile for satellite images has been a long-time interest of mine. I've printed many pictures using home-made machines, photographic paper, and cold cathode light sources. When I saw advertisements in amateur radio publications for PC HF Facsimile 4.0 by John E. Hoot of Software Systems Consulting, I was immediately interested. He claimed he could receive FAX images on a computer monitor using HF signals. They really looked good in the advertisement.

I sent for the program and put it on my computer. To say that I was satisfied would be gross understatement. But let me tell you about it.

The package currently sells for $99. When you purchase the program, you get: 1. a novel decoder (or demodulator) which requires NO external power source; 2. an audio cassette which describes FAX signals and tells you how to use the program; 3. an excellent manual; and 4. the program on a disk.

Easy Installation

Upon opening the package, I was first struck by the small size of the decoder. It fit on the end of an RS-232 connector. It doesn't require special boards or anything else; it only needs to be plugged into the serial port, either COM 1 or COM 2, of the computer. After plugging in the decoder, you connect the other end of the wire to the audio output jack of your HF receiver.

Loading the program into the computer was standard, with no surprises. The manual covers installation using floppy disks and hard disks, and for running the program on floppy disks only.

The manual instructs you to listen to the audio tape next, which is an excellent idea for this type of program. I have heard hundreds of FAX signals over the years, yet I found the tape very useful. While it cannot generate a picture, the tape does a fine job explaining facsimile signals and what they sound like. The tape is especially a good idea for those with limited experience in listening to FAX signals. It's also an excellent way to learn about the correct way to tune in a FAX signal.

Mr. Hoot has even incorporated a tuning indicator in his program. When you press the "T" key on the computer, the screen turns into a tuning indicator with two reference lines for aligning the tuned signal. The signal from the HF receiver appears as a third line. As you tune the signal, this third line moves up or down the screen, depending on whether you are tuning up or down. It is only necessary to tune the receiver so this third line lies about ¼" above the top line on the screen for the carrier signal. When the signal starts to shift with the image being sent, the signals will fall between the two reference lines. For those of us who have had to tune FAX signals without such a device, this added touch is yet another reason the program is so user friendly.

Multiple Options

The main menu allows you to capture the image in color or monochrome, save it to disk automatically, go to the tuning scope, change the lines per minute for the type of picture you are receiving, i.e., 60, 90, 120, or 240 lines per minute. You can display the image, view the image, print the image, or zoom to a section of the image. In the file options you can set the prefix, list the directory, and write to or read from a file. Pressing "H" for "hardware" produces another screen with various options.

Photo A. The Earth's disk on Jan. 9, 1990 at about 2 PM CST, with infared view of streams of water vapor.

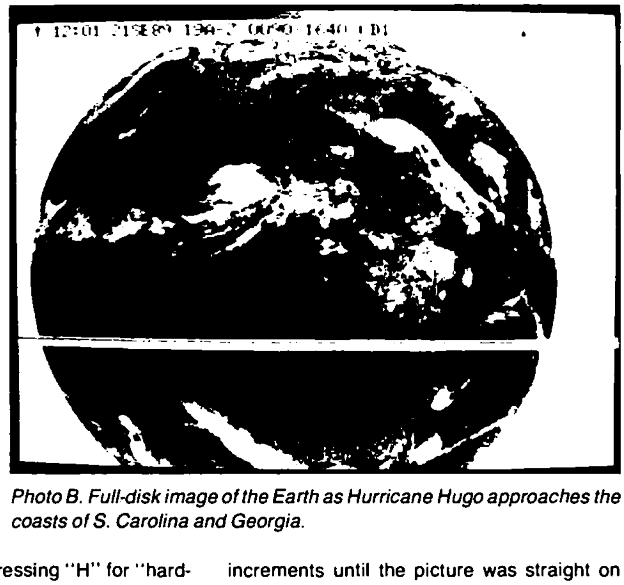


Photo B. Full-disk image of the Earth as Hurricane Hugo approaches the coasts of S. Carolina and Georgia.

The first thing to adjust in the "hardware" mode is the timing for your particular computer. The "C" for "clocks per pixel" lets you set the course figure for your timing. Mine needed no changing. The "T" for "timing correction" makes the final adjustment so the picture is vertical on the screen. The 360 which comes with the program was merely changed in small increments until the picture was straight on the screen. Mine ended up at 220. This is a very easy adjustment to make.

The remaining options on this screen relate to your printer type, graphic card type, monitor type, demodulator port (COM 1 or 2), and scans per line (6 for CGA, 4 for EGA, 3 for VGA). I set mine at 3 because I use a VGA monitor, which produces the best resolution.

I tuned in a FAX signal and printed a picture. It was a full-disk image sent by NAM. When I

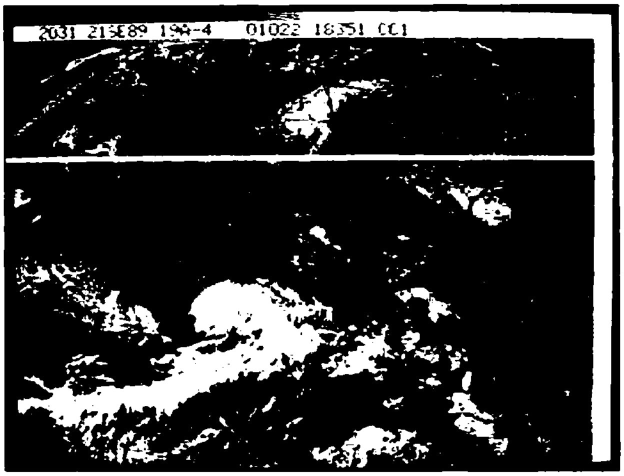


Photo C. *Hurricane Hugo closer up, just off the S. Carolina coast on Sept. 21, 1989.*

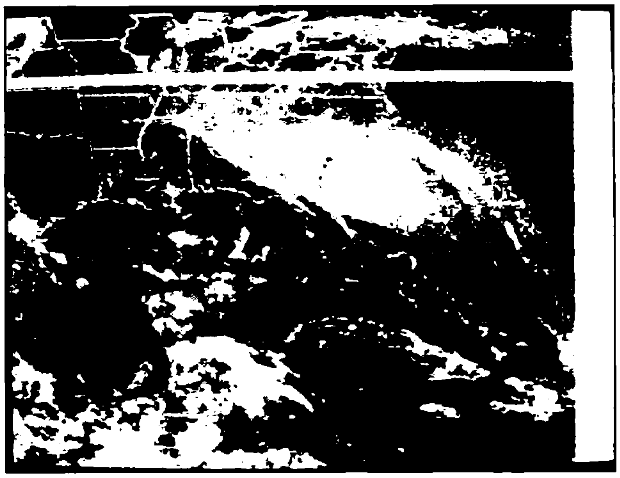


Photo D. Zoomed image of Hurricane Hugo, from Photo C.

saw the gray scale appear on the computer screen, I knew I had a good program even before the picture was sent. I was surprised to see that even with some noise on the signal (due to a bad antenna connector on my receiver), the picture was better than anything I had seen on a computer screen before.

I have copied many more images in the short time I have had the program, and they have all been good. I should add that the signal must be good to get a good picture, but this program seems to be more tolerant of noise than anything I have used before.

The accompanying pictures were taken with a Polaroid camera directly from the computer screen. Note the number of shades of gray in the upper left corner of each picture.

Mr. Hoot has even incorporated a long list of HF stations which send HF FAX signals. The list includes frequencies and times of day as well as the location of the station.

PC HF Facsimile 4.0 by John Hoot is a good buy—it works great! *[Ed. Note: Version 4.1 is now being shipped which allows the use of COM 3 and COM 4 serial ports]*

You may contact J.S. Gurske K9EYY at 7240 Highway Y, Lodi WI 53555.

Number 12 on your Feedback card

73 Book Review

A Radio Journal 1912–1940

A book full of memories.

reviewed by Larry Ledlow, Jr. NA5E

A Radio Journal 1912–1940
by Russ Rennaker W9CRC
Published by R&R Press
Kokomo, IN
Softbound, 69 Pages
Price: $9.00

Author Russ Rennaker W9CRC takes us on an amusing trip down memory lane with his book *A Radio Journal*. The book's 70 pages are chockfull of Russ' own recollections of his first interests in radio as well as wonderful anecdotes related to him by fellow workers in the broadcast industry. Russ' memory seems unclouded as he describes his early adventures. He gives the younger reader a feel for what it was like in the good ol' days, and I'm sure many old timers will find many memories of their own described in the book.

Russ grew up in rural Indiana, part of a farming family, but technology of the day held his attention more than plowing. At ten he discovered radio for himself after reading *The Sinking of the Titanic*. One chapter of the book described the wireless operator pounding out CQD (the distress signal of the day) in vain as the great ship went down. This chapter captivated Russ' imagination, and he began to explore the library to satisfy his hunger for information on the new technology of wireless.

Thanks to incredibly tolerant parents, Russ continued his own experiments with radio. Bad timing—the Department of Commerce suspended licensing during World War I—prevented him from obtaining an amateur radio license in 1917. In 1920 he finally obtained the call 9CRC.

The young experimenter made quite a reputation for himself building radios just as broadcasting began to take shape. Eventually he went to work for a local radio station as an engineer. From a humble beginning at a local 50 watt station, Russ' career eventually took him to CBS.

Russ has had the pleasure to work with many well known entertainers of the early radio days. He has also crossed paths with many respected broadcasting engineers. As a result, Russ shares many interesting behind-the-scenes stories about those he worked with. The early days of live "pick ups" were frought with potential disasters, and the Russ' anecdotes prove Murphy's Law beyond doubt. They also prove radio could be as fun behind the scenes as on the air, although for different reasons.

The book contains a number of fascinating photographs of early equipment, not the least of which is a 2kW quenched gap spark commercial transmitter dating to 1920. Amazing stuff!

In all, readers will find *A Radio Journal* a fascinating trip through time. It is very easy to read and informative. Readers of all ages will probably learn something from Russ' journal. W9CRC provides an entertaining and educational look back at the early days of radio. I can recommend it for a pleasant change from our hetic, high-tech lives of today.

Tune in on the New Frontiers of VLF

Simple converter brings the low low bands in on 80-meter receivers.

by David Curry WD4PLI

Ever wanted to try Very Low Frequency (VLF) operation, but didn't know how to get into it? If so, and if you have 80m capability, you may want to try this project—the 80AU.

The 80AU provides active whip preamplification of an incoming signal, then upconverts it to the 80 meter amateur band. The unit's 5-element Chebyshev filtering eliminates broadcast and above frequencies. A balanced mixer rejects spurious signals, and it has phantom power capability for remote operation. Used in conjunction with a quality shortwave or 80 meter amateur receiver, this converter accurately converts all frequencies from 5 to 450 kHz, up to frequencies from 3.5 to 4 MHz.

There are many fascinating and unusual signals on the LF and VLF frequencies, as well as the activity within the 1750 meter band (160 to 190 kHz).

You can use any 5- to 10-foot wire for an antenna, but I highly recommend using a Citizen's Band 102" steel whip, available at most electronics stores. With this whip, you can use the converter in remote and mobile operation, or on the top of a roof for clear, unobstructed reception. The wire antenna will also work, and you can use it if you are limited to "invisible antennas," such as in apartment complexes. Longer antennas will work, but they need a small series capacitor at the input port (J1). See the "Operation Requirements" section for more information on this.

The 80AU is very sensitive, so use a separate ground, located directly at the antenna site. A ground rod placed in the earth directly under the active whip and connected to the coax braid or the 80AU box, will provide the best ground reference, clean and free of noise. The coupling method shown in section B of the schematic is an excellent way to separate the two grounds and provide good broadband coverage. If you use this particular circuit, be sure to use battery power to eliminate any coupling to the AC power line.

Whip Placement

The active whip site is CRITICAL. Always locate it away from power lines and above or away from the house and other structures. At my house, the active whip is located right in the front yard near the sidewalk, against a chain link fence. The "higher the better" rule also applies, helping the signal-to-noise ratio by lessening capacitive coupling to structures where noise may be present.

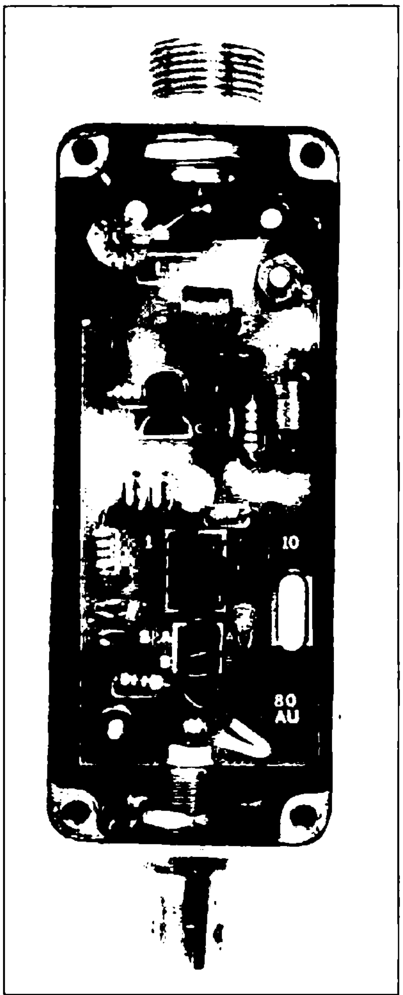


Photo A. Inside the 80AU converter.

Sometimes just moving the antenna 3 or 4 feet can make all the difference. Experiment after finding what you think might be the best area. A tree can be an excellent place, when the 80AU is placed on a wood pole at the very top, away from limbs. Use a wooden pole for mounting to avoid rust.

Tune In!

Once you've decided which coupling circuit method to use and you've "planted" your antenna, simply apply power and tune the receiver within the 3.5–4 MHz range. You can use the direct readout in kHz to accurately indicate the frequency if you are using an amateur receiver or any other type of receiver with a calibrated kHz display, either analog or digital. As an example, if you were listening to a signal and the frequency indicated on the dial was 3.680 MHz, then you would actually be receiving a signal at 180 kHz. The "3.5" is dropped or subtracted. This adjustment quickly becomes second nature.

Operation Requirements

The 80AU antenna input uses an SO-238 style plug, which interfaces with PL-259 plugs and banana-style jacks. You can use a longwire antenna by simply inserting a 39 pF capacitor between the 80AU input port and the longwire antenna. This works exceptionally well for untuned, broadband coverage. Tuned antennas can also be used in the manner described above, by coupling the tuned antenna lightly to the 80AU input through a 39 pF capacitor. However, a simple stainless steel 102" CB whip provides the best consistent overall performance for portable and land-based installations.

Coupling Methods

The operation of the 80AU is simple. The unit typically is mounted remotely because it needs to be mounted near the active antenna; and the active antenna typically needs to be mounted away from the house to keep the received noise level as low as possible. For convenience, I power the unit using the coax that conducts the RF from the upconverter to the 80m transceiver.

You must use a coupling device end to apply power to the coax for "phantom" pow-

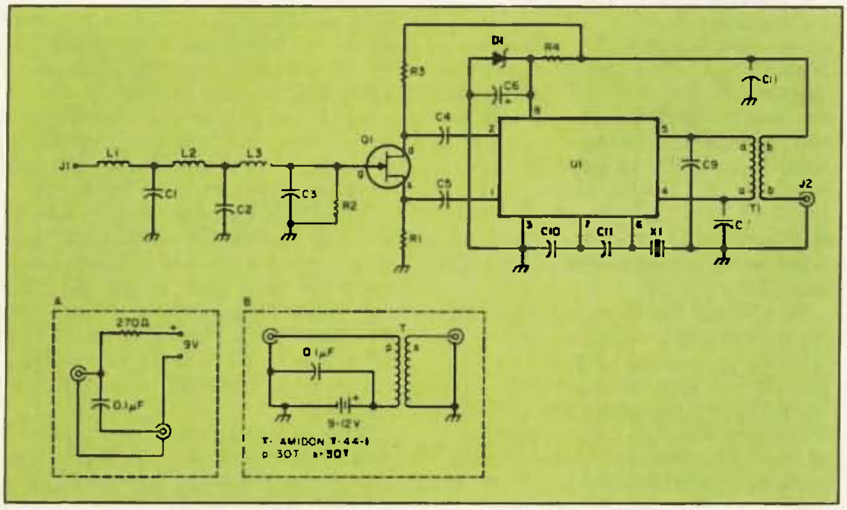


Figure 1. Schematic for the 80AU converter.

er, and to effectively couple the RF to the receiver. Notice the two methods drawn in sections "A" and "B" of the schematic.

Section A shows a simple resistor-capacitor combination that works well for mobile, remote or "clean" ground systems at home. Most ground systems in homes are "dirty" because the ground, or common, return for the AC power line carries the leftover remains from all the neighbors' light dimmers and power line hash. Also, it's securely coupled to the power lines over the course it takes from the power pole to the house. I suggest that you try to ground your system at the house, but even with this precaution there is no guarantee that the ground will "sink" all the noise, especially when the ground rod is placed in sandy or poorly conductive soil. The active whip will capacitively couple to the coax going to the 80AU and pick up all the noise, even if the 80AU is located far away from the house, where it can also couple to the power lines.

Technical Details

Input impedance	22kΩ
Input frequency response	5–450 kHz (450 kHz–3 dB point)
Converter output	3.5–4 MHz broadband
Filter passband ripple	0.4 dB
Mixer noise figure	0.5 dB
Mixer third order intercept point	−17 dBm
Mixer type	Doubly balanced, active bipolar
Power requirements	5 to 18V DC, 12 volts nominal approx. 30 mA

Parts List

Resistors: All ¼ watt, carbon composition		
	R1–R3	22kΩR4470Ω
Capacitors	C1, 2	47pF NPO 50V DC/10%
	C3	30 pF NPO 50V DC/10%
	C4, 5, 8	0.1 µF/50V DC
	C6	4.7µF electrolytic, 16V DC
	C7, 9	470 pF NPO 50V DC/10%
	C10	150 pF NPO 50V DC/10%
	C11	47 pF NPO 50V DC/10%
Inductors	L1,3	8.2 mH Miller #70F823AI
	L2	9.1 mH Miller #70F913AI
Transistor, IC, Miscellaneous		
	Q1	J310 JFET
	U1	NE602
	X1	3.499 or 3.5 MHz Crystal
	T1	Output toroid transformer: Amidon T-37-3 Primary: 26 turns, #26 Ga. (black) Secondary: 5 turns, #22 Ga. (red)
	D1	1N753A
	2	Pairs of 4/40 nut and bolt, ½" length
	2	¼" spacers
	1	Aluminum housing, Hammond Mfg. 1590A
	1	SO-238 connector
	1	BNC connector

Construction

Spread out all the parts so that you can identify them using the the parts list. Be careful when you install the inductors (L1–L3) and the JFET (Q1). The JFET is VERY static-sensitive, so be sure that you and your soldering iron are well grounded. Insert Q1 last to avoid overheating and to reduce the chances of zapping the poor thing.

Use a small soldering pencil (NOT a soldering gun) between 25 and 60 watts, and a good quality rosin core solder. Find the NE602 IC and insert it into the board so that the key at the end of the IC will line up with the key drawn on the component-side silk-screen. Push it through and solder all the leads. Clip excess leads after you're done. Insert all parts from the component side, where the silk-screen is printed. Then insert diode D1 so that the band around the diode is aligned with the band drawn on the part silk-screen.

Now insert the resistors, using the parts list for correct insertion. The resistors are marked by an "R" showing where the body of the part should be placed. Solder diode D1 and all resistor leads, and clip when through. Make sure that the bodies of the parts are against the board, and not lifted away after you've finished soldering.

Now insert and solder the capacitors. An oval shape drawn on the board identifies the locations for the capacitors. The polarity of these parts isn't important, but C6 is an electrolytic. It is identified by a small circle with a "+" on the upper left side, indicating where the positive lead should be inserted. Be sure that the negative and positive leads are identified and inserted into the board so that the polarity will match correctly.

Crystal X1 is identified by the frequency on the side of the part, which should be read either 3.499 MHz or 3.500. This should be inserted and soldered. Apply as little heat as possible to solder X1, as the crystal is temperature sensitive.

Final Assembly

Insert the large RF connector through the appropriate hole, from the inside of the box.

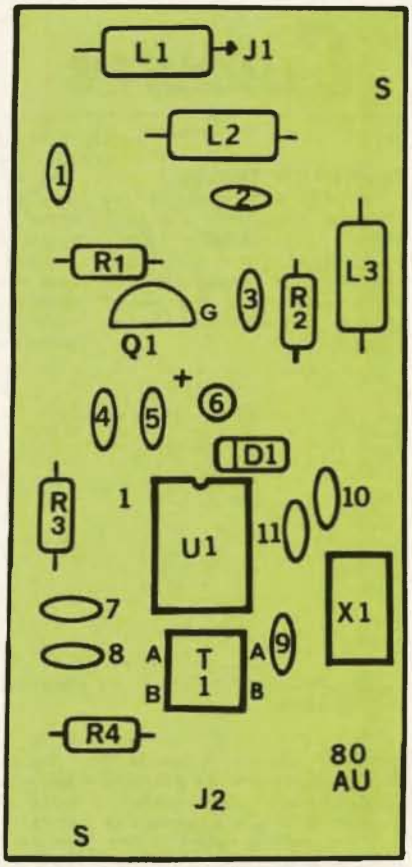


Figure 2. Components layout diagram.

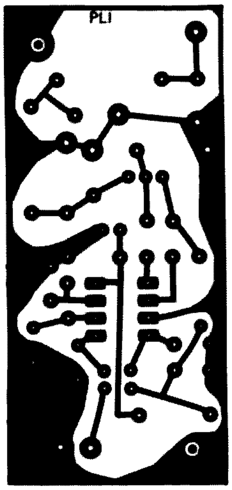


Figure 3. Interface foil pattern.

Once it is in place tighten it with the included bolt. Do the same with the remaining smaller BNC RF connector placed opposite the SO-238. Both connectors should have the solder lugs on the inside of the box.

Next, insert the two screws through the holes in the box from the outside and, holding the screws against the box with your fingers, put the ¼" spacers over the length of the screws inside the box. Take the circuit board and feed the screws through the holes marked "S." Then, push the board toward the bottom of the box, with all circuit board components facing toward you. Tighten the two 4/40 bolts against the circuit board to finish mounting the board securely. The spacers will lift the circuit board away from the box enough to prevent accidental shorting.

Cut the wire from J2 and solder it to the solder lug of the BNC connector. Also, cut and solder the remaining lead from L1 to the solder lug of the SO-238 connector. The body of L1 should rest at a near vertical angle to the circuit board, with the lead to the connector going across almost horizontally. It is important to keep this inductor as vertical as possible to minimize inductive coupling with L2. Also, keep in mind that you don't want L1 to sit too close to the aluminum box. Visually inspect the parts. When you're satisfied, close the lid and tighten the four screws.

Next, look at L1, L2 and L3. These parts are made of many, many turns of very fine wire, and have a manufacturer's number on the side to indicate which inductor to insert into the marked area on the board. All of the inductors indicated on the board are marked by an L. L1 is a little bit different: One lead is pointed toward J1, the terminal of the SO-238 connector, which will be mounted on the housing later. The other lead of L1 is soldered into the hole on the circuit board, just like L2 and L3.

Transformer T1 is a toroid or round transformer with four wire leads, two red and two black. All four leads need to be stripped of their enamel insulation. Use any fine sandpaper to remove the enamel, leaving the four wires bare and ready for soldering. Place the body of the toroid between the holes marked "A,A" and "B,B." The two small black wires, one on each side of the toroid, go into the holes marked "A." The remaining two red wires on each side of the toroid go into the holes marked "B." Pull the wires through the holes gently but firmly, then solder them well to the solder side. Inspect the solder joints, then clip the excess leads.

Take a small piece of copper wire about 1" long and insert it through the hole marked J2. Solder the wire on the foil side of the circuit board and clip any remaining lead length.

JFET Q1 is last to be inserted, with the shape of the transistor matching the shape drawn on the component side silk-screen. Insert the three leads so that the JFET body remains approximately ¼" inch from the circuit board. Solder all three leads quickly so that you don't overheat and damage the device. Clip excess leads after soldering.

Check all the parts one last time against the parts list for correct part insertion. Visually check for any accidental solder bridging on the solder side of the circuit board.

A kit for this project, including the circuit board, housing, and all the parts, is available for $59, postpaid. I will also make just the etched board available for $7.50, postpaid. Contact *Curry Communications, 852 N. Lima, Burbank CA 91505.* ■

David Curry WD4PLI has been a ham for over 15 years. He specializes in RF electronics. Dave is also a professional musician, and owns a small communications business, Curry Communications, which specializes in small electronics kits. Contact him at 852 N. Lima Street, Burbank CA 91505.

Number 14 on your Feedback card

CIRCUITS

Great Ideas From Our Readers

Heathkit HW-8 Speaker

The HW-8 is a fine rig, but you have to use high impedance headphones for listening. Sometimes, two or more people would like to listen at the same time; other times, you might like to listen via a speaker as you work around the shack. Also, some of us hate wearing cans!

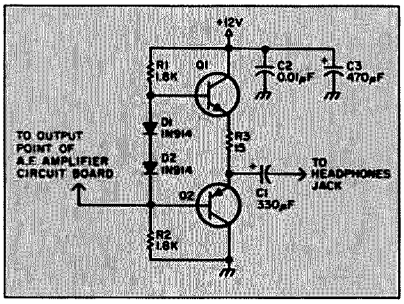


Figure 1. Parts for this modification are easy to find and inexpensive.

The only thing keeping the original circuit from directly driving a speaker is the high output impedance of the rig's transistor audio output amplifier. I came up with a mod to let the rig drive an 8 ohm speaker to a comfortable listening level. It mounts on the back chassis, adds little to the rig's current draw, and is not a major re-design. Finally, parts are not critical, and they're easy to salvage. If you must buy them, they're inexpensive.

I simply cascaded an extra amp between the receiver's audio output amplifier and the headphone jack. This method also ensures that you can easily restore the rig to its original condition if you want to sell it or try a different experiment.

My solution was a simple complementary push-pull amplifier. This circuit's idling current is only a few milliamperes, and since the voltage gain is around one, oscillation problems are minimized.

Figure 1 shows the circuit. I used a pair of salvaged silicon transistors close to the 2N2222/2N2907 combination. Two silicon diodes (D1 and D2) are used for biasing; any switching or rectifier diodes should be fine.

The values used at R1, R2, and R3 set the current draw. The trade here is between low current and low distortion. For this circuit, an idling current of about 3 milliamperes seems to be a good compromise. R1 and R2 should be the same value to set the idling output voltage at about one-half supply voltage. This is necessary to allow a full swing in output. R3 thermally stabilizes Q1 and Q2, and lowers the gain a little. This is the resistor to change to set the idling current of Q1 and Q2.

C1 is used as a coupling capacitor. Its X_C should be low compared to the speaker at the lowest operating frequency. Using an 8 ohm speaker and 500 Hz, this comes to an ideal minimum value of around 330 µF. C2 and C3 are for decoupling and RF bypassing. I recommend a value of several hundred pF to around 0.01 µF for C2, and several hundred µF for C3. Be sure that all capacitors have a voltage rating of at least 20 volts.

I built this circuit on a small piece of perforated board, tested it for current draw and any excess heat, and verified that it worked, all even before I took the cover off of the rig. This could also make a good output amplifier for many of the direct conversion sets popular in QRP work. In this case, it wound up putting my HW-8 on the air more often than before.

Larry Gotts WA3UKC
Box 490, Susquehanna University
Selinsgrove PA 17870

Improve Drake TR-6 Front End

The Drake TR-6 six meter transceivers originally used TI-588 transistors in the RF amplifier stages. Since the original design, transistors with more gain and lower noise figures have been developed. At present, the best device for the job is the U-310 FET. These are available from RF Parts, 1320-16 Grand Ave., San Marcos CA 92069 ($15 minimum order).

If you're at all handy with a soldering pencil, and you have *two* pairs of hemostats or locking scissor-type tweezers to use as heatsinks, you can easily perform the modification. Remove the bottom cover of the set. Locate the double compartment just to the rear of the REC GAIN control. The second half of the compartment contains a slug-tuned coil (L10) and the two RF amp transistors (Q11 and Q12). Observe the layout in Figure 2 to make the change.

[FETs are easily destroyed by static discharge or excessive heat. Follow all normal anti-static precautions, and use TWO locking-type heatsinks, as the author suggests, when soldering connections common to both devices!—Eds.]

L.J. Hemmis K3VLQ
919 West Gore Rd.
Erie PA ■

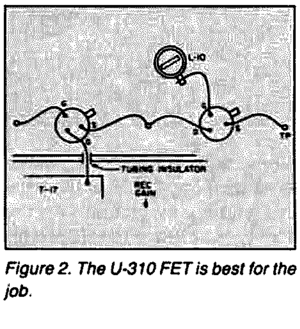


Figure 2. The U-310 FET is best for the job.

Experimental Gaussmeter

Low cost, easy construction.

by J. Frank Brumbaugh KB4ZGC

Continuing publicity warns of the danger of continued exposure to magnetic fields generated by everything from toasters, TV sets and electric blankets to amateur radio equipment and high voltage power lines. Wayne Green W2NSD has suggested numerous times in his editorials that hams could use a cheap, simple and sensitive gaussmeter.

This gaussmeter is a junk box project, and represents only one approach to the design of such an instrument. I offer it neither as the only, nor even the best, method of detecting and measuring magnetic fields, but rather as a "foot in the door" design which I hope others will improve upon. I have purposely kept it simple—no bells and whistles—so even a beginning ham can build it at minimum cost and know how to use it.

A gaussmeter will detect only dynamic—moving—magnetic fields, such as those generated by an alternating current. Static magnetic fields, produced by magnets, can be detected only by moving either the probe or the magnet, so that the lines of force, cutting the probe coil, increase and decrease in strength, allowing the gaussmeter to detect and measure them.

Circuit and Winding

The circuit of this experimental gaussmeter is illustrated in Figure 1. When magnetic lines of force cut the coil in the probe, a voltage is induced which is applied to the inverting and noninverting inputs of IC1 in push-pull. This voltage is amplified and then applied through R2 to the base input of a Darlington pair of 2N3904 transistors, Q1 and Q2. This pair of transistors amplifies and inverts the input voltage across the collector resistor, R3.

Collector voltage swing is monitored by a 0–1 mA meter which is zeroed by ZERO potentiometer R6. Thus, meter indication will increase in proportion to the strength of the magnetic field detected. The resistor in series with M1 allows the meter to measure the full voltage swing across R3, which will vary from about 8 or 8.5 volts to near zero volts in the presence of a fairly strong magnetic field.

The instrument is powered by a 9-volt battery, BT1. Current drain is 10 mA with no magnetic field detected, and increases to nearly 15 mA at maximum. S1, the ON-OFF switch, is a part of the ZERO adjust pot, R6.

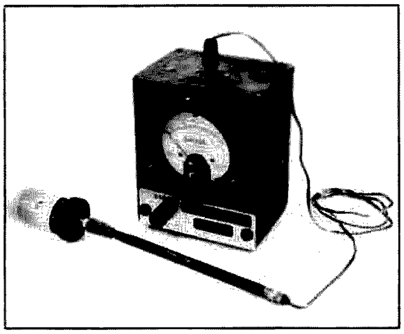


Photo A.

Probe Coil

The probe I used, illustrated in Figure 2, is made from the winding of one of the AF filter chokes removed from a US Navy 1020 Hz Range Filter, WW II surplus. The winding consists of approximately 1000 feet of AWG 28 enamel-covered wire. Its DC resistance is 70 ohms. Cross section of the coil is about ¼" x ⅜" and the diameter of the pie is approximately 1". The central hole, left when I removed the core laminations, is about 7/16" square.

I wrapped the coil in aluminum foil to form an electrostatic shield so the instrument would respond only to magnetic fields, and installed it in a plastic 35mm film can. An aluminum film can would be better, but I didn't have one. The container used to hold the probe coil must be nonferrous—not made of iron or steel. A pair of insulated wires are connected to the ends of the probe coil, and the other ends connect to the two inputs of IC1.

The probe coil is extremely important in this gaussmeter. It must contain enough wire—many turns—so the maximum number of turns can be cut by the external magnetic field, but the resistance should not be too great or too little. Most hams have small chokes and audio transformers in their junk boxes, and this is the best place to look for your probe coil. You can make a quick check with an ohmmeter and a magnet.

Measure the resistance of your coil, and with the ohmmeter attached, pass the magnet rapidly across the end of the coil. If the ohmmeter swings widely, the coil will probably be usable in your probe. If there is insufficient swing, try another coil. Primarily, the probe requires many turns of wire, but not too great a DC resistance.

Simple but Sensitive

This gaussmeter, though extremely simple, is quite sensitive. With 117V AC 60 Hz applied to the primary of a power transformer, and with no load current being drawn from the transformer, a weak magnetic field will be produced around the (unshielded) transformer. Bringing the probe coil near the transformer will develop nearly full-scale indication on meter M1. Swinging the probe across any magnet—a refrigerator magnet will do—will produce a high peak on the meter as the probe crosses the magnet. Moving the probe across the lower portion of any d'Arsonval meter, or the vicinity of the voice coil on your speaker, will produce the same results.

Parts Used

All the parts I used came from my junk box, which is why I used an LM324 quad op amp, when only one section is used. You can substitute it with just about any comparable op amp. Likewise, though the transistors in the Darlington connection are 2N3904, you can use any similar general purpose NPN transistors: 2N2222, 2N4124, MPS6531, etc. For M1, you can use any meter you might have lying around, up to and including a 10V DC voltmeter. If you use a more sensitive meter than 0–1 mA, change the value of R5 appropriately, so the meter will measure about 8V DC full scale. Many small 100 uA and 200 uA meters are available from most parts suppliers for a dollar or two. You can get the other parts at Radio Shack or from mail order dealers, who will

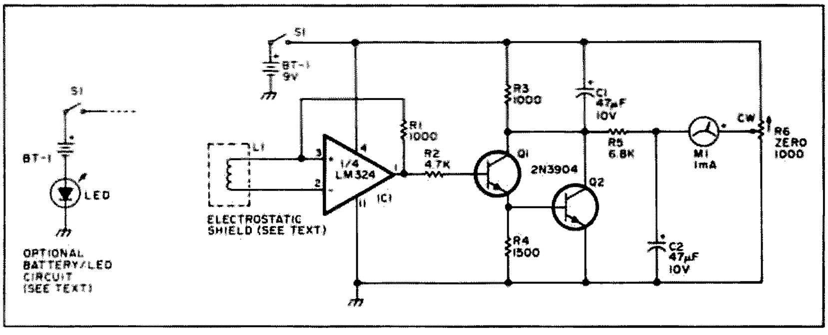


Figure 1. Schematic of the experimental gaussmeter.

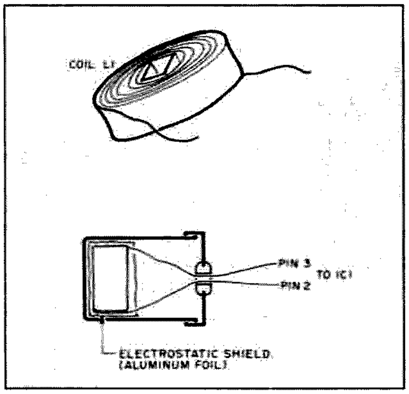


Figure 2. The probe, showing the coil and L1 mounted in a 35mm film can.

probably have better prices.

This experimental gaussmeter is a prototype, purposely made as simple as possible to test the design. It is calibrated in gauss, with calibration points at 50, 75, 100, 150, and 200 gauss. I used a Standard Magnetic Field Generator which I designed for calibration. (See below.) Some of you may have access to magnetic standards at work, and will know how to calibrate your gaussmeter. Hopefully, some of you will improve upon this design. Let's hear from you!

Important Details

Note in Figure 1 that feedback resistor R1 is not connected to the "-" input as is normally done when you use op amps. This is done on purpose to increase the sensitivity of the gaussmeter. Connecting R1 from the output (pin 1) to the "-" input (pin 2), the normal connection, reduces sensitivity and causes the meter to read backwards. If you do use this connection, adjust the ZERO pot, R6, for full scale meter reading with no magnetic field input. The meter will now read downwards on the scale in the presence of a magnetic field. Switching this feedback resistor with a SPDT toggle switch will provide two ranges of magnetic field values.

If you wish, you may connect a miniature LED in series with the battery, BT1, to serve as a power-on indicator. This will not increase battery drain, but it will reduce the available operating voltage by about 2 volts, thus reducing the voltage swing monitored by meter M1. If you decide to use this "free" current source for the LED, change the value of R5 to 4.7k ohms.

Be sure to observe polarity of the LED, which will not be very bright, though brightness will increase with the detection of a magnetic field, using the connection of R1 (see Figure 1). If R1 is connected in the "normal" configuration described in the above paragraph, the LED will grow dim when a magnetic field is detected. ■

Parts List

BT1	9V battery
C1, C2	47 µF, 10V electrolytic cap.
IC1	LM324 (one op amp used)
L1	probe coil (see text and Fig.2)
M1	0-1 mA DC meter
Q1, Q2	general purpose NPN 2N2222, 2N3904, 2N4124, MPS6531, etc.
R1, R3	1000Ω, ¼W, 5%
R2	4.7kΩ, ¼W, 5%
R4	1.5kΩ, ¼W, 5%
R5	3.9kΩ, ¼W, 5%
R6	1000Ω, potentiometer with S1
S1	SPST switch on R6

Number 16 on your Feedback card

Standard Magnetic Field Generator

Build an instrument to calibrate your gaussmeter.

by J. Frank Brumbaugh KB4ZGC

Now that you've built your gaussmeter the next step is to build an instrument that will accurately calibrate it. This is an easy project, using a home-brew coil, a potentiometer and a plug-in wall transformer delivering low voltage AC. This instrument will generate standard magnetic fields that can be varied between about 20 and 1,500 gauss. The standard magnetic field is generated inside a solenoid coil. Increasing the current through this coil will increase the level of the field generated.

Figure 1 shows the circuit. Any small power transformer with a secondary voltage of 6 to 15 VAC can be used to power the instrument. I use a plug-in transformer which produces 8.2 VAC, rated at 224 mA, although at times I draw in an excess of 600 mA from it during the calibration process. Potentiometer R1 must be wire-wound, not composition, because of the magnitude of AC current passing through it. I used a 1,000 Ohm pot from my junk box to control coil current, allowing for generation of fields from under 20 to about 1,500 gauss inside the coil. Mount a pointer knob on the potentiometer so that calibration marks can be placed around the control on the panel.

The Standard Solenoid

The most important component is the coil—the standard solenoid. It is inside this coil that the standard fields are generated and where they must be sampled. The coil can be of practically any length. It must be close-wound with enamel-covered magnet wire, and the inside diameter of the coil form must be large enough to accept the probe of your gaussmeter. Coil form material can be of cardboard, plastic, or even a length of copper, brass or aluminum tubing. If a metal form is used (do not use iron or steel) it should be wrapped with a layer of plastic electrical tape to prevent inadvertent shorting of the coil. I used a plastic deodorant container.

The wire used to wind the coil must be large enough for the maximum current it will have to carry. The greater the strength of the magnetic field, the greater the coil current will be. I used AWG 26 enamel-covered copper wire, close-wound over a 5 cm length, approximately 110 turns. (Be sure to count turns! You will need this information later.) Also, try to make the coil winding length some multiple of 5 cm or 10 cm—5 cm is 5% of one meter, so the number of turns of wire in this length, multiplied by 20, gives the required "number of turns per meter" used to determine field strength in gauss. In the instrument described here, 110 turns multiplied by 20 equals 2200 turns per meter.

Calibration Procedure

Calibration requires measuring AC current in milliamperes. The AC milliammeter should be connected between J2 and J3, while the AC voltage used to power the instrument is fed into J1. Vary potentiometer R1 while noting the AC current. Use this current reading in the formula below to determine the gauss level of the generated magnetic field:

Gauss = Turns per Meter x AC Amperes (Coil Current)

In this instrument, with 8.2 VAC supplied, coil current varied between approximately 0.008 and 0.650 amperes AC.

To calibrate for specific values of field strength, use the following formula:

Coil Amperes = Gauss/Turns per Meter

Mark your calibrated gauss values on the front panel around the pointer knob in increments of your choice.

If your DMM will not measure AC current, you can measure the voltage across the coil—it will be in millivolts. Use this value and the DC resistance of the coil to calculate coil current using Ohm's Law.

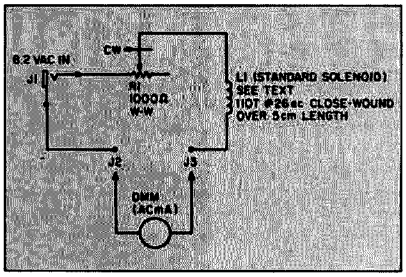


Figure 1. Standard magnetic field generator.

Calibrating Your Gaussmeter

Connect a piece of wire between J2 and J3 on the field generator, then connect a lead between one end of the standard solenoid to your gaussmeter common ground. Turn the gaussmeter on and zero its meter. Insert the probe coil into the standard solenoid so it is centered in the middle of the coil. Apply AC power to the standard magnetic field generator. While watching the meter reading on your gaussmeter, rotate potentiometer R1 clockwise to the first calibration point which provides a meter indication. Mark this point on the meter face. Continue setting and marking additional calibration points on your gaussmeter over the full arc of the meter pointer. This procedure will calibrate your gaussmeter. ■

Contact J. Frank Brumbaugh KB4ZGC at 82 Liddell Street, Buffalo NY 14212-1824.

73 Book Review

The Cuckoo's Egg

Author: Clifford Stoll. Publisher: Doubleday, Bantam Doubleday Dell Publishing Group, Inc., 666 Fifth Avenue, New York NY 10103. Copyright, 1989. Price, $19.95. ISBN: 0-385-24946-2.

A hacker breaks into the Lawrence Berkeley Lab Unix computer, and no one notices. He carefully calls up a program left earlier. It hatches like a cuckoo's egg in another bird's nest, pretending to belong. The program has been collecting passwords.

The hacker then activates a little-known backdoor in the system software and has control of the computer, all of its functions and the widespread network of the machine's connections to other computers. The hacker has become a super user, able to access any account. Reaching out to closed military computers and US government systems, he picks through directories and downloads files at will. After carefully covering his tracks through the electronic network, he leaves. A small error, 75 cents, turns up in the Berkeley computer's accounting records, a leftover of the hacker's actions. It remains a minor glitch till the new system manager is asked to find the problem.

The Cuckoo's Egg by Cliff Stoll K7TA is a true story of the year-long search for an electronic spy, the "Hanover Hacker." In true Berkeley fashion, Cliff, an astronomer and unlikely computer wizard, does not appear to be a typical computer manager. Wearing T-shirts, faded jeans, long hair and sneakers, he must convince government agencies like the CIA, FBI and NSA that a very serious computer security problem exists. Even with solid proof that computer tampering and potentially sensitive military data is being compromised through holes in supposedly secure systems, he receives little cooperation until the government agencies realize that international espionage is involved.

When he is not at the lab monitoring the hacker's moves, Cliff employs his office PC to watch for the hacker. When triggered, his machine calls his pager number and, using creative software, sends letters via Morse code through the modem and out to his pocket receiver, telling him who is hacking and from which port on the Berkeley mainframe. Many a night's sleep and shopping expedition are interrupted in this fashion.

With help from Tymnet, a communications company that interconnects computers around the world, the hacker is traced via phone lines across the US, over the Atlantic via satellite, and into the heart of West Germany and the German Datex network. Further traces, done by following relay connections in local phone offices, pinpoint the hacker.

Computer enthusiasts will find the book fascinating as electronic signals are traced through hundreds of computers across the Western Hemisphere. Hams will appreciate the chase, similar to a transmitter hunt on VHF.

Some have complained that there is not enough insight into the West German hacker's motives or the spies behind the scenes. They have missed the point of the book. Here the pursuit, or quest, is the challenge, and the means are more important than the end. At the end of a transmitter hunt, emphasis is on how you got to the goal, not who was there. This is a captivating book, difficult to put down.

Although Cliff's original purpose was to put his computer logbook into a readable format to avoid repeating his story to those asking for details and advice, it has become much more. He has become an authority on computer security. After several weeks on *The New York Times* bestseller list, *The Cuckoo's Egg* has found exceptional interest among the general population as a thrilling and captivating spy story in an electronic world told by an unlikely '60s-style hero.

Before K7TA's "egg" hit the bestseller's lists, I had considerable difficulty locating a copy. If you can't find the book at your local bookstore, try Advanced Electronic Technologies, Suite 173, 5800-A N. Sharon Amity Road, Charlotte NC 28215. Tel. (704) 545-2681. They have it for $19.95 plus $5.00 shipping and handling. *The Cuckoo's Egg* is a real winner.

—Review by Andy MacAllister WA5ZIB

Number 17 on your Feedback card

LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Avenue
Saugus CA 91350

The League Lemming Effect

Have you ever heard of the "League Lemming Effect"? Probably not, since it's a term I coined a few years ago. I was trying to explain to a ham buddy how the league is able to generate massive mailings to the FCC, Congress, and anyone else.

A lemming is a short-tailed, furry-footed rodent most noted for its mass migrations to the sea each year where many drown. Biologists haven't been able to explain this suicidal activity other than describing it as an instinctive reaction to overpopulation (the migrations occur during peak population levels). Instinctive behavior may be fine for lemmings, but humans do not need to rely on instinct alone. Humans are meant to think and reason.

People who react to outside stimuli with little sense of reason are like lemmings controlled by instinct alone. "Trekkies" who would give up their lives and fortunes to fly off to some distant galaxy with Capt. James T. Kirk and his crew on the *Enterprise* are a pretty good example of the lemming effect. Rationally, they know it's an impossibility, but their fanaticism overrides their judgment.

Now, let us apply the lemming effect to ham radio. Just about every major ham publication has its lemmings. So does the ARRL. Sometimes these people are called "groupies." Those who have followed the career of *73's* Wayne Green W2NSD call themselves "Wayne Watchers"—a designation that W2NSD once told me he abhors. Most publishers prefer to call their lemmings devoted and politically involved subscribers. The ARRL simply calls them "league members." In all cases, it is you and I who are considered lemmings, albeit never in public.

The lemming effect can be constructive or destructive. For example, when the hams of 220-222 MHz saw the threat of commercial takeover, their leaders were able to use the lemming effect to generate thousands of letters to the FCC in opposition to the change. While it may not have affected the outcome, it has caused a lot of would-be spectrum grabbers to think twice before going after the ham bands.

A decade ago, California attorney Joe Merdler N6AHU taught the ARRL how to arouse its members to political action. Aroused members encouraged congressional sentiment to force the FCC to act on malicious interference. The league was a fast learner; the first success of the "League Lemming" came in 1963. The FCC proposed a no-code license, and league members sat at their typewriters awaiting word from the "gods of Newington" as to whether they should write letters in favor of or opposed to the proposal.

When the ARRL hierarchy indicated that "no code was bad code," every lemming began to write virulent comments echoing the philosophy. Member after member dutifully—instinctively—wrote in support of the ARRL position, probably never bothering to read the proposal itself.

Were you one of those lemmings? Did you help kill no-code back in '83 only because the ARRL told you to? Did you detest no-code only because the ARRL detested no-code? Did you write a letter against no-code only because your ARRL director suggested that you write one? Did you engage typewriter without engaging brain?

Now we come to the 1990s. Seven years have passed. When Fred Maia (*W5YI Report* and *W5YI-VEC*) and Don Stoner W6TNS (National Amateur Radio Association) broached the no-code subject once again, the ARRL quickly took the lead in exploring the idea. It publicly formed its own No-Code Advisory Committee, and publicized the committee's work. It never told its members to write the FCC to favor the release of an NPRM on the idea, but it didn't have to. It was what the ARRL didn't say that was obvious. They were not publicly declared against the issuance of the NPRM, so therefore they must favor it. And, dutifully, the "lemmings" wrote in support of the ARRL position on release of a no-code NPRM—but only if it touted the "official ARRL doctrine."

PR Docket 90-55—Yes or No?

But now for the $64,000 question. The NPRM in the form of Docket 90-55 is out. Will the ARRL support it or try to shoot it down? It's not exactly what the league petitioned for. In fact, it's not really what any of the dozen or so petitioners want. While some of it follows the "league line"—pun intended—it also seems that the FCC is using the occasion to try to lighten its workload a bit. But not the way you might think.

It finally dawned on me the other day that the FCC doesn't want to get rid of the Novice and Tech Class licenses purely because of financial housekeeping. Only the Tech falls there. But to figure it out, I had to stop thinking like a normal human being and assume the position of a Washington bureaucrat.

The bureaucrats want to eliminate the Novice Class license because they fear that too many 11.5 meter "types" are getting Novice licenses without taking legitimate tests. Unlike the testing for other license classes, Novice testing is done outside the VEC system. Rather then considering it a blessing that they now have some control over the 11.5 meter ops by virtue of their obtaining ham tickets fraudulently—and then investigating and prosecuting such offenders—such enforcement is instead seen as a financial burden. While you "lemmings" may be saying, "Wow, what a great way to keep the CB riff-raff out," you are also praising a government agency for its failure to do its congressionally mandated job.

I believe retention of the Novice Class ticket is essential for us and the ARRL. Not because it's the traditional entry to amateur radio, but rather because it's the logical step up from a limited Communicator privilege. It takes a group of hams that could number in the tens of millions, and removes their isolation from 222-225 MHz and 440-450 MHz FM—where most will probably wind up—and gives them a sample of mainstream amateur radio on 10 meters. It does this with a fairly simple exam of 5 wpm Morse code. The FCC proposal is, in reality, that of going from no-code and minimal theory to 13 wpm code and a test for beginning engineers! Are they trying to create an "RF Ghetto" above 222 MHz? I cannot help but wonder.

If the FCC is adamantly determined to exterminate it, will the ARRL then say—as it did in 1983—that "no code is bad code"? And will all of you who are now in favor of a no-code license still think your own thoughts and write comments on Docket 90-55 that are truly yours? Or will you again put on your "furry feet" and follow your leaders to the death of our service in the sea of its own mire?

I have no idea what position our ARRL will take. I hope it strongly supports retention of the Novice license, but endorses all other aspects of Docket 90-55. I hope the FCC is willing to negotiate on the Novice license. If they want only four classes to administer, why not Communicator, Novice, General and Extra? That's a logical progression to me, so lets offer it and see how they react. Want to bet it will be unacceptable?

According to an MCI message I recently received from ARRL President Larry Price W4RA, sometime this summer the ARRL will file a public position on no-code, PR Docket 90-55, before the FCC. Will you simply echo the ARRL's position, or will you file—if you haven't already—comments of your own? If you just echo the ARRL line, you are naught but a "league lemming."

I for one hope that you are more than just a lemming. I hope that you are truly a person of your own. de WA6ITF

Number 18 on your Feedback card

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS. Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters l or i, or even the number 7. Thank you for your cooperation.

I would like to hear from anyone who could help me set up a radio club at my Shrine temple. Thanks. *Charles E. Martin AB4Y, 7103 Shawnee Way, Reynoldsburg OH 43068-5126.*

A dedicated Apple IIe user is looking for information and software accessories for the Apple Graphics Tablet & Tool Kit. Any info will be greatly appreciated. Please write first if money is involved. Will trade software. Thanks. *Geoff Malta N2HOQ, 5263 Deborah Drive, Piscataway NJ 08854.*

Wanted: YAESU FT-625RD memory option. *Charles T. Huth, 229 Melmore St., Tiffin OH 44883. 419-448-0007.*

Does anyone have the mods for the Heathkit HW-24-h dual-band transceiver/repeater? Any help would be appreciated. *Dave Digiuseppe, 5685 Hibernia Dr., Columbus OH 43232.*

Wanted: Information about any 12-17 meters modifications to HeathKit SB-102. Thank you. *Robert Ames N4SXG, 2105 South Indian River Drive, Fort Pierce FL 33450.*

I would like to know if anyone is aware of a modification for the Kenwood 2570 to extend the receive frequency range. *Hoyt Duff, 2209 Newbern Lane, Virginia Beach VA 23451.*

Needed: A copy of the Uniden Shop Manual for the Madison Base Station 11 Meter Radio. I would be glad to pay copying & postage for this manual. Please forward replies to *Jerry Ham, PO Box 405, Freehold NJ 07728.* Thanks and 73s.

Wanted: Ham programs for the Commodore VIC 20 computer. Terminal, CW, Packet, etc. Please send cost requirements and a description of the programs to *Ray Bergeron KA1UMW, 16 Church St., Lewiston ME 04240.*

I am working on a directory of publications that pertain to radio communications (electronics, amateur radio, CB, SWL, scanners, etc.). If anyone has anything to contribute to this directory or would like to correspond with me regarding this, please write to *Ryan Lughermo, PO Box 413, Midland MI 48640-0413.*

Needed: A card extender for an old Harris TR280 1940s radio. Will pay for this item. *Gary Dunlap, PO Box 3245, North Shore CA 92254. 619-393-1937.*

Wanted: Modification for ICOM-725 for all frequency operation. *Rick Thompson N0HKE, 13654 Hidden Creek Drive, Andover MN 55304.*

Needed: Schematic for KYOKUTO DENSHI Model FM 144-10sxr II, 2m mobile radio. Will pay all cost. *Ray Fallin WD0HCH, 253 W. Sumner St., Hartford WI 53027.*

I'd like to use my FAX machine on UHF. Could anyone give me information on FAX transmission standards or interface boxes? Also, several years ago, I got QSL cards printed by N&S Print, 2533 W. Orangewood Ave., in Phoenix, Arizona. They've gone out of business. Can anyone tell me who got their plates? TNX. *Klaus Spies WB9YBM, 8502 N. Oketo Ave., Niles IL 60648.*

ICOM Service Survey

It's almost painless . . .

by Gordon West WB6NOA

No one likes to send a radio back to the factory for service. It's a real pain to package it up, get it over to UPS, and wait patiently for the factory to fix it. But ICOM has made factory service almost PAINLESS. Its service department is well-structured and customer-oriented.

As soon as ICOM receives your unit, they send you a postcard to acknowledge receipt and the condition of your unit upon receipt. Knowing for sure that your unit was received intact is very reassuring. In addition to confirming that your rig made it, the postcard provides you with your repair tag number, box number, and an estimate on turnaround time.

ICOM Keeps Track

The extensive ICOM computer system tracks your transceiver every second through the roughly two-week repair cycle. The ICOM service team can find your rig quickly, and even tell you how many rigs are ahead of yours.

The ICOM service computer system also monitors repair patterns. Every week, the service manager analyzes these patterns and informs manufacturing of common failures so that they can make changes early to correct them.

Mark Allen WJ7X, former service manager, says, "We also monitor the performance of our bench technicians on our computer system." The computer keeps track of an award-point system for technicians meeting certain service goals. High performance statistics earn positive points, of course; but any unit that comes back with the same problem for repair earns the technician negative points!

Allen WJ7X: "Everything we do goes into the computer where it's carefully analyzed to provide our customers with the best possible service." The computerized readouts even give the number of minutes a telephone line was busy, and the time between incoming calls. For a typical month one year ago, the computer gives these statistics for customer service calls:

- Monthly amateur radio customer service calls: 788
- Land mobile customer service calls: 215
- Marine radio service calls: 419
- First service call question: out of band information
- Second most common question: status of unit in for repair
- Third common question: current product information
- Fourth common question: new product technical information
- Fifth common question: WARC band modification

The Big Two: Time and Money

Amateur radio average turnaround time is 5 working days, and the average repair cost for the most common problems is $76.20. The hourly charge for out-of-warranty repairs is $55, with a one-hour minimum charge.

Photo A. Dave Wiegle and Tom Moore KF7GH, Technical Customer Service Supervisor. Gary Fiber KF7XV (not shown) is the customer service phone consultant.

Photo B. ICOM technician repairing a handheld.

Photo C. Good service begins with good test equipment and know-how.

Contacting ICOM for Service

ICOM Headquarters, Washington	(206) 454-7619
ICOM Service, Atlanta, Georgia	(404) 991-6166
ICOM Service, Canada	(604) 273-7400
ICOM Service, Irving, Texas	(214) 550-7525

The most common service problem concerns batteries. The most common problem with incoming equipment is damage in shipping due to poor packaging by the customer.

When ICOM technicians repair equipment that the owner has modified for out-of-band use, they take care not to disturb the modification. However, if the modification is causing the problem, they remove the modification.

The most common errors customers make which result in equipment failure are: using an improper power supply, making improper modifications, and not protecting the equipment from lightning.

During the 90-day warranty period for mobile and HT units, and the 1-year warranty period for HF base stations, there is no charge for parts or labor. Even if you did not send in the warranty card, your unit will be repaired under warranty agreement if you send in proof of purchase.

In some cases, when possible, an extra $25 will expedite repairs in an emergency. Turnaround time for parts orders is one day.

Package It Right, Please!

As noted above, poor packaging by the customer and consequent damage during shipping is a common problem. A bench technician said, "Our client was amazed when we told him his radio had sustained shipping damages—after all, he had carefully wrapped it up in newspaper and sealed it up with nylon tape. . ."

The equipment needs to be WELL-CUSHIONED! Newspaper—even crushed—doesn't work. For further advice, read the section on "Sending In Your Unit" in the Kenwood Corporation Service article in the April issue of *73*. Kenwood also listed poor customer packaging as a common problem.

Be sure to include your phone number with your unit, too. "We hope every ham will include their phone number along with their equipment so we might call them up in case we have a problem duplicating the equipment failure. We recommend that all hams use the *73 Magazine* request form so we know where to contact them during the day and in the evening. We aggressively call hams by phone to further document the problem with the unit they have sent in," says Tom Moore KF7GN.

Before You Call ICOM

Be sure you have this information on hand for the customer service representative: the type of radio, serial number, date of purchase, and place of purchase. If you've already sent your unit off and received acknowledgment, keep the postcard showing your repair tag number and box number nearby.

Eric Heineman, of Support Marketing Groups, is the ICOM service manager at headquarters in Bellevue, Washington. Tom Moore KF7GH, Technical Customer Service Supervisor, is the key person in service personnel. Rick Young KC7PC is the Bellevue service supervisor. Kimberly Cottongim supervises the service parts department.

It isn't necessary to have your dealer look at a defective radio before you send it to ICOM. Also, you don't have to notify ICOM before sending your equipment in, and you don't have to call ahead for a return authorization.

Inside the Service Department

Twelve technicians at ICOM headquarters in Washington State have been trained to repair microprocessor units, circuit boards, VFOs, and other equipment. The other service centers have three technicians each. All service centers are located near airports for quick turnaround time. No radio ever goes back to Japan to be fixed!

ICOM's service and marketing personnel exhibited a positive attitude toward customers and clients. At ICOM, regardless of how the problem occurred, the customer is king.

The ICOM service crew shares the exasperation of repeat service problems. One of the service supervisors said, "When a radio comes back for the second time with the same problem, it goes to the head of the line, and we may even begin replacing strategic components. . .Our technicians take a repeat failure personally—after all, it shows up on their month-end service evaluations, and they are hams, too. . ." In the beginning of 1990, ICOM was receiving approximately 550 repairs per week. The computer indicated that less than 0.8% came back for a repeat failure fix.

The bench technicians were quick to point out that some repeat failures might be attributed to problems on the airwaves, not within the unit. Case in point—a handheld that came back for the reception of out-of-band signals. When the customer service department phoned the customer, they discovered that the unit was tied into a rooftop high-gain antenna system, surrounded by twenty rooftop repeaters! It was no wonder that the handheld was picking up intermod or experiencing severe desensitization. Rather than an equipment failure, this was an operational error of using a piece of gear in an unsuitable environment. A handheld transceiver cannot reject out-of-band signals when tied into a high gain antenna and operated at a repeater location.

Listening in on the ICOM customer service lines, it was clear to me that ICOM personnel encourage hams to discover the cause of their problems in the field, if possible, so that they don't have to send their units in.

I asked ICOM technicians about the lithium battery scare we all heard about a few years ago. Will all ICOM lithium batteries go dead after a few more years of use? A bench technician responded, "The lithium batteries will probably outlast the equipment. We expect a base station to go for 15 years before the battery needs replacing. On handhelds, 7 years is the minimum—but we expect those lithium batteries to carry on for twice that amount of time." Soon you will be seeing articles about how to change lithium batteries without dumping the memory on your sets, but for now, ICOM is not worried about their lithium batteries going bad.

ICOM maintains a boneyard of dead, unrepairable radios. "On some very old ICOM sets, we may use this stockpile of equipment for parts no longer made," says a technician who routinely works on older sets. An eager, young Japanese technician said, "Just the other day at a hamfest, I spent $5 for an old ICOM set so I could scavenge the channel selector plate off the front of the radio for a repair I had in the shop." He didn't mind spending his own five bucks to take care of his client.

ICOM uses the latest in service equipment. They also have NiCd battery "checker exercisers," a "bake and shake" table, a "deep freeze" for troubleshooting radios that quit in the cold, and "life-test jigs" that continuously monitor the performance of a transceiver with a possible intermittent.

Reader Response

Bob WB6TKM ". . .sent in an old IC-720—dead as a doornail. Got it back 6 weeks later, looking like new, and a note of explanation on why the delay—they had to wait for a transplant to replace something on the inside. ICOM postcards kept me up-to-date—great service."

Leroy Smith's IC-740 encountered reoccurring problems and states, "I don't believe the American techs are on a par with Japanese techs." He further indicated that certain ICOM intermittent failures should be recognized by the company that has thousands of sets out there with possibly the same problem.

Mike KC1CS says, "Four-week turnaround on an ICOM 751A. They added all factory mods, and tuned up everything. They did a great job."

Larry WN8P says, "I found that the service manual schematics did not follow the actual equipment on the IC-551. Labels for boards and schematics were different. ICOM acknowledged the problem with certain waveform pictures, but I have yet to receive an up-to-date manual. In general I have found that schematic diagrams and parts lists of all manufacturers, such as ICOM, Kenwood, Heath, etc., do not follow IEEE standards. Heath's use of the block numbering system has been out since at least 1975."

Bill KA2OVR says, "We lost out as a manufacturing nation, but as a service nation, we are more negative than negative. Yaesu and ICOM are for the birds. Ten-Tec continues to be our shining star."

Happy to say, 38 more letters came in the mail, mostly positive regarding ICOM service. It's a real pro show. "Service is good business for ICOM," says Mark Allen, who now works entirely in marine communications. "No one can beat our service."

Backward Inverted L Antenna

This low-band wire antenna is a good performer on both transmit and receive.

by Stan Gibilisco W1GV

In the March 1988 issue of *QST*, Doug DeMaw W1FB points out that closed loops have advantages for reception because they are less responsive to noise than open loops or dipoles. His design provides vertical polarization for low-angle radiation, another good feature for low-band DX operation. After experimenting with balloon-supported antennas and longwires at 1.8 and 3.5 MHz (see "Balloon Supported Antennas" in the September '88 issue of *73*), I wanted to try something that would last and have better noise immunity than previous antennas.

DeMaw's design has the high-current part of the antenna vertically polarized near the station (although some of the high-current portion is horizontal), and this apparently is the reason for the low angle of radiation and response. A quite popular antenna for 160 and 80 meters is the inverted L, also having this characteristic (see Figure 1a) when the length is ¼-wavelength. Ideally, the inverted L would be ½-wavelength with ¼-wave going up and ¼-wave going horizontally at a height of ¼-wavelength above ground (Figure 1b), but this is not always possible because of space limitations. I have neither the resources nor the kind of neighbors who would enjoy looking at a 125-foot vertical structure.

The typical inverted L would probably have poor noise characteristics because of its broad bandwidth, vertical polarization, and the fact that it is not a closed loop. The "balloon verticals" provided good evidence of the kind of noise reception that can occur at 1.8 MHz with large, vertically polarized antennas, and I was ready to try some other design, at least for receiving. Alas—a ⅝-wave balloon vertical puts out a whopping state-side signal at 1.8 MHz!

Terrain Considerations

The house here is on a hill and there is plenty of room for antennas out back, although the terrain slopes downward starting at about 200 feet from the back door. There are plenty of trees about 50 feet high, both on the hill and on the flat below the downslope. Getting an antenna up high above the ground is difficult near the house, but easy some distance away. Any vertical portion of an antenna would have to be located far away from the house. How would I get a high-current loop near the far end of the antenna? One answer was to ground the far end, rather than leaving it free, as is the usual practice.

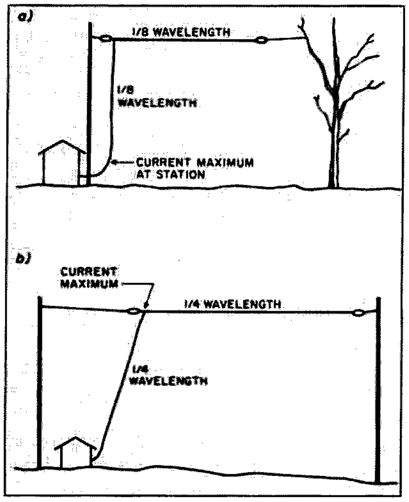


Figure 1. Inverted L antennas cut a) for quarter-wave; and at b), half-wave. The half-wave design has the current loop at a good elevation, and also has high feedpoint resistance, both desirable features for end-fed antennas.

There is nothing that says the far end of an antenna must be a free end. When this is the case, a voltage maximum and current minimum are found there. Grounding the end of the antenna causes this situation to be reversed. The ground should be a low-loss ground for RF. This means there should be numerous radials, not just a ground rod. This presented no problem at my location; there was tall grass and shrubbery all around in the vacant lots adjacent to the house, so no one would be likely to trip on radial wires laid at the surface.

I chose a tree about 100 feet to the north of the house for securing the far end of the antenna. This tree was just slightly below the level of the house and about 50 feet high. A support just 35 feet tall would result in a horizontal span of wire from the house to the top of the tree. This scheme is shown in Figure 2. The antenna is about 45 feet from the rig to the top of the support, 100 feet from the top of the support to the treetop, and 45 feet to the grounded far end, for a total of 190 feet. Since I have a wide-range antenna tuner, I was not especially concerned about the impedance at the feedpoint.

The antenna was easy to install, the support near the house being made from aluminum tubing and the rest of the antenna from A.W.G. No. 15 aluminum electric fence wire. The ground was made using a short iron stake (I've heard copper kills trees). This provided a mechanical anchor. The actual RF ground was made using the aluminum wire, which sells for $13.49 per quarter mile. I installed 12 radials, each 125 feet long, representing ¼-wavelength at 160 meters. I had to bend and cut some of the radials short because of the yard getting in the way (see Figure 3, top view of Inverted-L system). The radials were arranged at angles as nearly equal as possible.

A Little Theory

This antenna, about 195 feet long, is not resonant at any amateur frequency except perhaps 30 and 15 meters, and also somewhere in the 10 meter band. I was not concerned about resonance. However, since the far end of the antenna is at a current loop, it would be expected that if the antenna were operated at the frequency where it is ½-wavelength or any multiple thereof, the input impedance would be fairly low and purely resistive. For example, a 132-foot antenna would be resonant at 80 meters, and also at all of the harmonic bands.

Since the well-grounded (RF) far end is always a high-current point, there will always be good low-angle vertically polarized radiation and response, no matter what the frequency, as long as the vertical section is fairly long (say, 0.1-wavelength or more). This can be qualified if the frequency is so high that the vertical section measures more than about ⅝-wavelength; the radiation angle would be raised in this case. This might be of some concern at 28 MHz and perhaps at 21 MHz as well. I had the lower bands—160, 80 and 40 meters—in mind when I conceived this antenna.

Station Grounding

A good ground system at the station is an

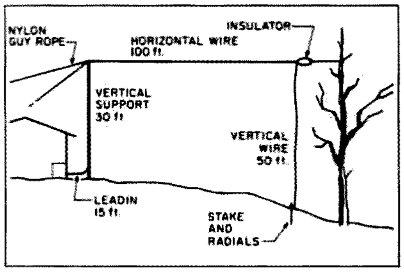


Figure 2. The "backward inverted L" or "inverted U." Note that the far end is grounded, ensuring a current maximum along a vertically polarized part of the antenna. (Radials not shown.)

advantage, even though the feedpoint may not occur at a current loop. The situation is essentially the same for this antenna as it would be for any end-fed, multiband antenna. I don't have a permanent radial system at the station, since burying a kilometer of wire is a true chore, and kids, lawn mowers, etc. tear up radials laying on the surface. (In the winter, if there is enough snow, you can lay them under the snow pack.)

Fortunately, there is a cold-water pipe running through the wall right behind the transmitter, and there is a removable piece of wall plaster that exposes the pipe for direct connection. This is pure coincidence, as I did not even realize this existed when I chose the transmitter location. Did Murphy miss one? Likely not—there was some evidence of RF in the shack at some frequencies even with this copper pipe tied directly to the radio with heavy braid, a sign that plumbers may have installed lengths of non-conducting PVC pipe. You cannot take a good RF ground for granted. Ideally there should be several ¼-wave (or longer) radials emanating from the station.

The horizontal span would provide high-angle radiation and response at all frequencies, making this antenna very similar to the inverted L, except that the main vertical portion would be at some distance from the shack rather than adjacent to the shack.

The antenna described here closely resembles DeMaw's loop, except that the low horizontal part is missing. The equivalent circuit is essentially the same, however, and I expected that the results would be similar to those described in DeMaw's article. I tuned the antenna using my transmatch and logged

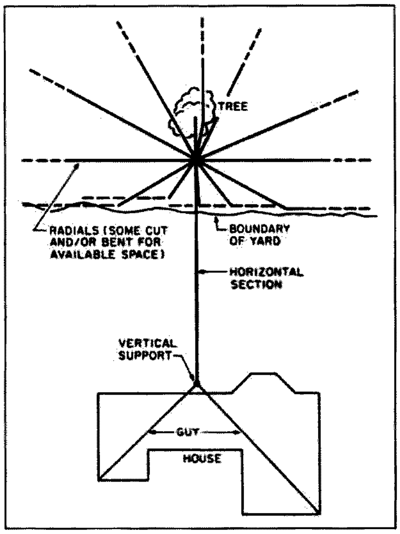


Figure 3. View of W1GV "backward inverted L" from above. Note how radials were bent and/or cut to fit within the available space.

all the settings for future reference, and awaited the early morning VKs and ZLs, as winter still had not given way to the QRN of warmer months at 1.8 and 3.5 MHz.

Performance

I received good signal reports on 160 and 80 meters using 75 to 100 watts CW output. This antenna could not compete with past experimental balloon verticals and "kite slopers" for transmitting, but the received noise level was much lower than it had been using the 880-foot longwire, and was certainly well below that received on the gigantic sky hooks.

Radiation Patterns

The inverted backward L wasn't rigorously tested for directionality. I received good reports from all over the continental US and Canada—there didn't seem to be any real "weak spots." I expect more thorough tests, however, to reveal that the backward inverted L radiates similar to a loop, since the actual antenna and its image form a loop with a circumference of about 390 feet, yielding almost a full wavelength circumference at 1.8 MHz. (See Figure 4.) This "loop's" plane is vertical, so the radiation patterns are expected to be horizontal and normal to the plane of the loop.

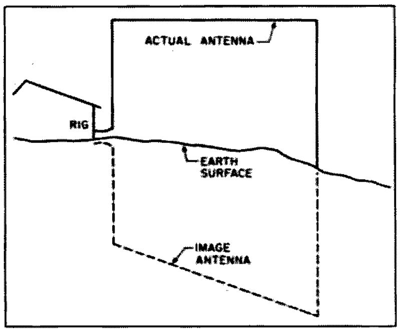


Figure 4. Diagram of actual antenna and image antenna, showing the equivalent vertical-plane loop that results from the combination.

I had no trouble hearing Europe in the evenings and Japan in the early mornings at 3.5 MHz, but have not yet heard those loud VKs and ZLs on 160. There doesn't seem to be much compliance with the idea that 1.825–1.830 MHz is DX only for transmitting.

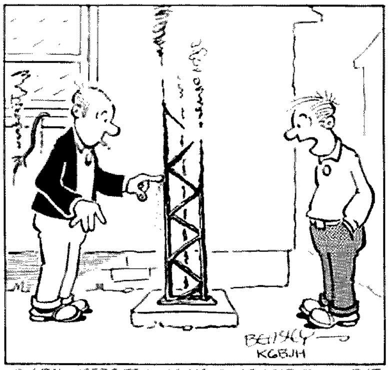
Although I have heard that loops and their equivalents (such as this antenna) may be susceptible to intermodulation from broadcast stations in the standard AM band, I have had no trouble with this. I am lucky not to be near stations in the 900–1000 kHz range, where second harmonics might be heard.

Good TX/RX Compromise

Little, of course, can beat the transmit capabilities of the balloon vertical or kite sloper, but it certainly holds its own, and is much better on receive. An ideal fixed wire system would be the inverted backward L for transmit, and a system of beverage antennas for receive, if the beverages are properly installed and matched for impedance. (Beverages outperform the "L" on receive.) The "L" also has the advantage of being grounded all the time for DC, so that when the station end is disconnected, electrical charges are drawn away from the house. That's peace of mind when those big, black thunderstorms start rolling in from the Midwestern prairie.

If you've got the space, I recommend the backward inverted "L." It's one of the better single transmit/receive wire antennas going for the low bands! ■

Stan Gibilisco W1GV can be reached at 871 S. Cleveland Ave., St. Paul, MN 55116.



OL' RAY KEEPS TELLING ME IT WAS ACID RAIN, BUT I THINK HE WAS JUST RUNNING TOO MUCH POWER!

Number 21 on your Feedback card

PACKET TALK

Latest in Digital Hamming

Brian Lloyd WB6RQN
124 Churchill Avenue
Palo Alto CA 94301

10 Meter Packet

In an earlier column I suggested that 800 Hz shift AFSK into an SSB transceiver might be just the ticket for 10 meter packet radio. I also suggested that 10 meters would be a good band for 1,200 baud packet, since the radios are inexpensive and Novices could operate there, too. Therefore, I reasoned, 10 meter packet was an attractive alternative to 2 meter packet operation at 1,200 baud. Sure of this, I purchased a Uniden HR-2600 transceiver for 10 meter packet experimentation.

My biggest concern was that the HR-2600 be able to pass a 1,200 baud signal without excessive distortion. It turned out that my fears were unfounded. In fact, if you compare the frequency response curves (see the figure) for the HR-2600 with the response curves for the 2m radios I evaluated about a year and a half ago, the HR-2600 stands up very well indeed.

I used a simple technique to measure the frequency response of the HR-2600. I connected an audio signal generator to the MIC jack and measured the power output into a dummy load. Since an SSB transmitter is a linear device (at least it is supposed to be) the power output should be proportional to the signal level at the MIC input. The only variation from this should be a function of any AF or IF filtering inside the rig.

I took measurements for both upper sideband (USB) and lower sideband (LSB) so that I could determine which had a flatter passband. See the figure for a graph of the audio frequency vs. relative RF output. I drove the rig to a nominal 10 watts output with a 1 kHz tone. The dB measurements are relative to that reference level.

As you can see, the HR-2600 is quite flat from about 600 Hz to about 4,300 Hz. This provides a bandwidth of 3.7 kHz, more than adequate for 1,200 baud. The 1,200 baud signal (Bell 202 modem) spans from about 600 Hz to about 2,800 Hz. This will fit quite nicely in the passband of the HR-2600. Considering that you can find the HR-2600 advertised in *73* for $219, this is quite a deal. You can't even buy a new 2m handie-talkie for that.

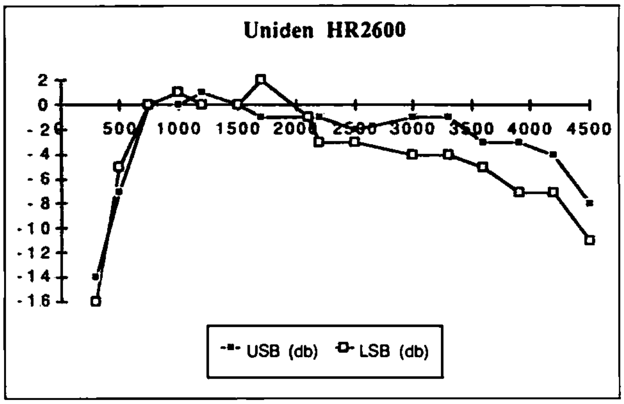


Figure. HR-2600 frequency response curve.

There is a drawback to the HR-2600: Its filter is quite broad, letting a lot of QRM in, if there is any about. This can raise havoc with the ability to receive packets if the QRM activates the AGC in the receiver.

Filters and TNCs

What about other transceivers? Well, you can use one of those expensive brands (hi), but their filters may cause you some problems. Most HF rigs nowadays have pretty respectable filters. These are usually somewhere between 2.1 kHz and 2.5 kHz wide with very steep skirts. The signal from the modem in a TNC running at 1,200 bauds with 1,000 Hz shift is about 2.2 kHz wide. This may not work with all filters in all radios.

If you have trouble copying packets, or others have trouble copying your packets, try running your modem in V.23 mode. Almost all TNCs can do this. With a Kantronics TNC it is a simple command (CCITT On). With others it is usually a simple adjustment. With a TNC-2 clone like the MFJ-1270 or 1274, simply recalibrate the transmit tones to 1,300 Hz and 2,100 Hz instead of 1,200 Hz and 2,200 Hz. If you have a TNC that uses the AMD7910 or the TMS3105 modem chips, you can make a very simple modification to make them operate in V.23 mode.

There is one fly in this ointment: most TNCs have carrier detect circuits that will not work very well (actually, most won't work at all) with an SSB radio. Why? Because they sense the noise and interpret it as signal. You could try the squelch with your radio (if it has one), but it your experience with squelches on SSB radios is anything like mine, you will give that up quickly. They just do not work well enough for packet radio.

If you plan to operate on 10 meters (or with any SSB radio on any band for that matter) it is a good idea to purchase and install the TAPR DCD modification kit (you don't need this modification with the MFJ-1278 since it already has it built-in). Which kit you get is a function of the type of modem in your TNC. If you have a TNC-2 or clone with a 2211 demodulator, you need the kit for the TNC-2. If you have something with a 7910 or a 3105 you will need the DCD modification that detects the carrier by detecting valid data in the data stream. Contact TAPR for more information on these kits.

Once you have everything hooked up, set the output level from your TNC so that it gives you about 70% of maximum output from your rig. This should keep the PA operating within its ratings. This also helps keep you in the linear operating region of the radio.

Packet on LSB or USB

Many people will tell you that you must use LSB for operating packet. While true for RTTY, this is NOT true for packet. You may use either USB or LSB. The only difference is in the tuning.

With a USB signal, the audio tones generate a signal above the carrier frequency, while with LSB the modulating tones generate a signal below the carrier. If you consider the center of the modem signal to be 1,700 Hz (halfway between the 1,200/2,200 or 1,300/2,100 Hz tone pairs) then you can figure out where your signal is. If you want your signal to be on 28.190 MHz and your radio is set for USB, you would set the transmit frequency to 28.188.3 MHz, 1.7 kHz lower than the desired frequency for your signal. If you are using LSB, you would set your transmit frequency to 28.191.7 MHz. That is all there is to it.

If you want 1,200 baud packet activity on 10 meters, look around 28.190 MHz. There seems to be a good deal of activity around there. I also recommend using 10 meter packet for local operation. If you are going to do local operation, pick a frequency that is not generally used for DX. I would try around 28.180 MHz or a little lower.

Remember that Novices can be a big part of your local packet operation if you give them a way to get on the network. Add a BBS or a switch (NET/ROM or otherwise) so that the Novices can reach the other users on 2 meters and above.

Well, try it and let me know how it works. Perhaps I will get a chance to work you there. 73

Number 22 on your Feedback card

HOMING IN

Radio Direction Finding

Joe Moell, PE, KØOV
PO Box 2508
Fullerton CA 92633

Jammer Busting

We hams are self-policing, right? You have read and heard about this since you began studying for your license. But if you've listened to recent emergency nets, you may have heard some things that made you think that our Self-Police were on strike. What gives? Have we lost control of our bands?

It's true that we hams have always tried to rectify technical and operating violations by ourselves. In a local ham's estate, I found an ARRL Official Observer (OO) notice over 60 years old! But the venerable OO program worked in the past only because hams were self-disciplined, and friendly persuasion was all it took to cure most problems. That's not as true today as it was a generation ago.

In 1982 a Congressional committee report praised amateur radio's ". . . tradition as the most self-regulated radio service in the United States." The report continued, "Less time has been devoted to monitoring and regulating the Amateur Service than to any other service because of its self-policing and discipline."

FCC Fades Away

Our reputation as "good guys" means that FCC enforcement people have been able to ignore us and concentrate on other spectrum users. This has gone on for so long, and the FCC's budget is now so tight, that when serious problems crop up, it's hard to get FCC help. The manpower is no longer available.

Keep in mind that most rule violations occur on weekends and at night, when our bands are most active. As often as not, the FCC's efforts to catch serious offenders must be done during off-hours, on their own time. On the other hand, hams usually have their best opportunities to patrol the bands and go transmitter hunting on their off-hours. So it's to everyone's benefit for volunteer hams to be allowed to gather evidence for proceedings against serious violators.

Congress and the FCC were confident of our ability to do this, so one of the provisions of the Communications Amendments Act of 1982 (better known as Public Law 97-259) authorized the FCC to form an Amateur Auxiliary (AA). The Congressional committee was excited that ham band policing could be done with "even less expenditure of government time and effort than in the past," to quote the report.

The combined OO/AA program (sometimes collectively called Voluntary Monitoring or VOLMON) has been very successful in some areas, but it needs much more participation. For rapid response to jamming on the DX bands, the Auxiliary needs transmitter hunters in every part of the country. Wouldn't it be great if each ham club had at least one member skilled at mobile Radio Direction Finding (RDF) on both HF and VHF?

For the last two months, "Homing In" has featured equipment we can use to help ourselves and the FCC by performing mobile RDF to locate jammers, intruders, bootleggers, and man-made noise. RDF gear is easy to build and can be used for competitive foxhunts as well as for more serious purposes.

VOLMON Builds Cases

As I talk to ham clubs and individuals, I realize that there are many misconceptions about what it takes to keep the bands clean. One incorrect assumption is that hams are self-enforcing. It's not true. Only the FCC can legally do enforcement.

Volunteer monitors scan the bands, using postcard OO notices and friendly reminders on hams with equipment problems or who momentarily forget the rules. But they don't prosecute offenders or mete out punishment. Public Law 97-259 didn't make us self-enforcing, but it did allow us to begin to work directly with the FCC, gathering evidence that the FCC can use to enforce its mandate.

The goal is for VOLMON-to-FCC contact to be a rare occurrence. VOLMON seeks to solve minor rule violations and amateur-to-amateur disputes entirely on its own, using reminders, persuasion, and negotiation as needed. FCC assistance should only be invoked in serious cases of Part 97 rule violations, and only after VOLMON has tried everything else to resolve the problem.

Sometimes FCC staffers want us to obtain all the evidence against a serious offender. In other situations, they want to do it themselves. It's up to the FCC to decide in each case.

Larry Guy, head of the Los Angeles Field Office, is typical of FCC field officials. He says, "I will not take a case until the Amateur Auxiliary has thoroughly worked it, documented it, and done everything possible within its charter to resolve the problem."

Documenting a hard-core jamming case doesn't mean simply accumulating a pile of copies of OO notices you have mailed out. It's not enough to make tape recordings from various base stations.

Only firsthand evidence is acceptable. The evidence must clearly point to the suspects. Just because you hear W6XYZ's callsign on a transmission doesn't mean W6XYZ made the transmission. There have been attempts to frame hams by playing tape recordings and using false callsigns.

Proper documentation means going mobile with RDF gear, tracking down the exact location of the suspect, charting the bearings, and correlating them with the contents of the transmission. You must be able to prove beyond reasonable doubt that the station you hunted down is the one causing the problem. All this data must be in a form that is easily understood by the FCC, the US Attorney, and perhaps a jury.

Larry Guy says, "This is the same type of thing we do when we take a case to the US Attorney. They want to look at the map; they want to see where our vehicle was and where the bearings met. They want to know if there were any other antennas in the area that could have been the source. We must also show them that all Auxiliary remedies have been exhausted."

These procedures may seem strict and arduous, but they're the same procedures that FCC engineers must follow when they build their own cases. If you were going to small claims court to get a monetary judgment, you'd gather and prepare every possible bit of evidence and documentation to increase your chances of winning. It's the same way with a jammer case.

Jammers Beware

It sounds like KØOV is giving aid and comfort to troublemakers by telling what it takes to prosecute them, doesn't it? Well, the hard-core jammers know all this already. Besides, it's really not difficult to gather the evidence, if you are dedicated and determined. An experienced team of RDFers can do it very quickly.

Rest assured that when the Auxiliary does its job properly, the FCC will act, if needed. An example is the recent case in Carefree, Arizona, where the FCC levied a fine on a ham for willful and malicious QRM on 75 meters.

VOLMON provided important documentation. Stephen Tsuya, who heads the FCC's Douglas, Arizona, office says, "Not only is the program working, it is providing invaluable help."

About the same time, cooperation between the Auxiliary and FCC Field Operations led to a malicious interference citation in Pasco, Washington, for jamming on 2 meters.

Continued on page 52

Photo. Building a successful case against a jammer requires careful documentation and lots of patience, but the results are worth the effort. (Photo by WB6UZZ)

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston TX 77083

Modems for Hamsat Operation

Aside from DX-chasing on AMSAT-OSCAR-13, the most exciting satellite activity this year has been via the digital modes on the Microsats and Fuji-OSCAR-20. To operate via these electronic mailboxes in the sky, you'll need a 1200 baud PSK (phase shift keying) modem in your hamsat-ready earth station.

It is no longer necessary to build your own PSK modem. Since March, companies like PacComm have been shipping units designed to interface with the necessary radios and packet TNCs (terminal node controller) for BBS activity from space. PacComm's modem, listed at $219.95, connects to the modem disconnect header inside the TNC. One land in the TNC is cut to allow connection of the unit. In addition to its 1200 baud mode, the PacComm model will receive 400 baud telemetry from AMSAT-OSCAR-13. PacComm's phone number is (800) 223–3511, and the address is 3652 West Cypress Street, Tampa FL 33607.

If you enjoy kits, TAPR (the Tucson Amateur Packet Radio Corporation) offers their PSK modem kit for $110. A picture of a completed TAPR unit was shown in last month's column. Soldering is tight. An iron with a small tip and a magnifying aid are helpful for constructing this unit. A box is not included, but you can find the recommended (now discontinued) Radio Shack enclosure at some stores.

Table 1.

```
                    Sample of F-O-20 BBS activity.

*** CONNECTED to 8J1JBS
FO-20/JAS1b Mailbox ver. 2.01
commands [B/F/H/M/R/U/W]
Use H command for Help
JAS>M
NO.  DATE   UTC    FROM    TO     SUBJECT
0138 02/25 21:53  DF5DP   WA5ZIB  Hi Andy !

0090 02/25 18:01  DL1CF   WA5ZIB  HELLO ANDY
0086 02/25 16:46  N5BF    WA5ZIB  Well, there you are!

0079 02/25 16:39  WB6LLO  WA5ZIB  HELLO ANDY!

JAS>F
NO.  DATE   UTC    FROM    TO     SUBJECT
0168 02/26 03:01  LU1EXC  LU1OGG  lusat 1
0167 02/26 02:55  LU8DYF  HK3JHV  Hola Colombia
0166 02/26 02:53  LU6DYD  ALL     CQ de .....

0165 02/26 02:52  LU6DYD  N4HY    DIGI LUSAT-1 EXCELLENT !!

0162 02/26 02:03  JH2XIL  ALL     CQ on FO-20
0159 02/26 01:35  N8HSP   WC8J    hamfest
0158 02/26 01:31  K0RZ    N1CHM   feeds
0157 02/26 01:30  N8AM    N8HSP   Hello
0156 02/26 01:27  N1CHM   K0RZ    Clarification
0155 02/26 01:26  N8HSP   N8AM    hello
JAS>R86
NO.  DATE   UTC    FROM    TO     SUBJECT
0086 02/25 16:46  N5BF    WA5ZIB  Well, there you are!

Andy,  Glad you finally got QRV on FO-20.  I never worked the
FO-12 mailbox myself so can't tell whether it is exactly the same
but I do know that all the features of FO-20 that I was familiar
with (JA, beacons, intermod, etc.) are identical.  Keep in touch
and good luck with upgrades.

73, Courtney
p.s. Your message was time tagged 16:37.  I'm putting this on at
16:50 according to my station clock, but don't know what the Fuji
clock is reading.  Were you on here just ten minutes ago or some
time last night?   CD
JAS>R138
NO.  DATE   UTC    FROM    TO     SUBJECT
0138 02/25 21:53  DF5DP   WA5ZIB  Hi Andy !

Hallo Andy, nice to see your callsign here on Fuji.

Best regards es vy 73 from Germany
de Bert DF5DP
JAS>H
++ Available commands ++


B     : List file headers addressed to ALL
F     : List latest 15 file headers
F*    : List latest 50 file headers
F<d>  : List file headers posted on day <d>
H     : Show this message
K<n>  : Kill a file numbered <n>
M     : List file headers addressed to current user
R<n>  : Read a file numbered <n>
U     : List current user(s)
W     : Write a file
```

Photo A. A G3RUH 1200 baud PSK modem hooked up to a packet TNC for Microsat or Fuji digital communications.

The TAPR unit works very well and is currently the most popular PSK unit in the US. It will easily interface with most TNCs using "hardware HDLC." It was not designed to work with the Kantronics KPC-1, -2, -4, -2400, KAM, or the GLB PK-1, all of which use "software HDLC." The kit incorporates three circuit boards, and includes parts, mating connectors, switches, and labels. To align the unit, you need a voltmeter, oscilloscope, audio generator, and frequency counter. You can reach TAPR at (602) 323-1710, or you can write to: PO Box 12925, Tucson AZ 85732.

Radiokit markets the G3RUH PSK packet modem for $111. The G3RUH design has been very popular with many international Fuji and Microsat enthusiasts. Although the "front end" design is modest, it is a very good performer. Restrictions on TNC compatibility are the same as those for the TAPR device. A typical uplink system is shown in Photo A. This modem, employed for Fuji-OSCAR-12 contacts, was built using a G3RUH board from AMSAT-UK. With the addition of antennas, a computer or terminal, and a 70cm SSB receiver, the Microsat and F-O-20 station would be complete. Contact Radiokit at (603) 437-2722. Their address is PO Box 973-C, Pelham NH 03076.

We expect DSP (digital signal processing) equipment from other companies later in the year, but prices for these units will be much higher than prices for single-purpose PSK modems. The DSP systems will be capable of operation via many data transmission formats in addition to PSK.

Interpreting Data

Once you have a station ready for PSK operation, what will you see on the screen when operating through the new digital satellites? Table 1. shows a sample of communications with the BBS on board F-O-20. As with a terrestrial packet BBS, several system commands are available for reading and writing messages, listing file headers, and showing the current users.

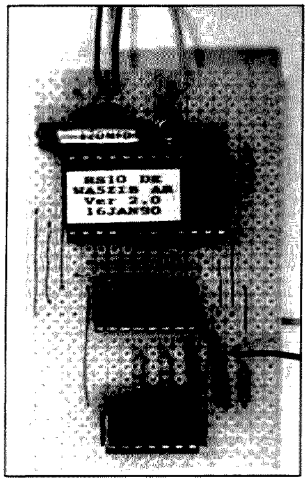


Photo B. "ROBOT CALLER" CW generator for RS-10 operation.

Unlike earth-based systems, the messages on the BBS are from hams all over the world who have accessed the system directly using VHF and UHF radios. The idea is exciting, and the system is online now. F-O-20 makes between four and six passes a day over most locations worldwide.

Table 2. is a sample of "digipeated" activity via the Argentine LUSAT-OSCAR-19. Before the BBS software was uploaded to the satellite, simple digipeater-type operation was implemented to give users a chance to exercise their equipment in preparation for full store-and-forward activity. You can see telemetry and informative messages between the packets uplinked from users. A complete frequency chart for all the new Microsats and F-O-20 was shown in last month's "Hamsats."

Operation through PACSAT-OSCAR-16 is identical to LUSAT. For WEBER-OSCAR-18, expect to see incomprehensible (raw picture) data. The picture data is compressed and sent via the PSK packet system on the satellite. It's necessary to capture the raw picture data and store it so that you can use appropriate software to describe it later. The AMSAT Software Exchange provides WEBERWARE 1.0, developed at Weber State University in Ogden, Utah, to put the picture packets in the proper sequence, "unsquash" the data and display the color result on a PC or compatible with EGA

Table 2.

```
Digipeater activity via LUSAT-OSCAR-19.

WA5NOM>HK3JHV,LUSAT-1*:

Hello from Gil in Friendswood, TX.

I am away from the terminal now.  Please leave your message.


LUSAT-1>TIME-1:

PHT: uptime is 073/12:54:49.  Time is Mon Feb 26 03:47:28 1990

WA5NOM>HK3JHV,LUSAT-1*:

Hello

WA5NOM>HK3JHV,LUSAT-1*:

This is Gil in Friendswood, Texas

HK3JHV>WA5NOM,LUSAT-1*:

hello, my name Juan Eduardo>

WA5NOM>HK3JHV,LUSAT-1*:

Glad to work you, Juan.  First contact on LUSAT.


HK3JHV>WA5NOM,LUSAT-1*:

greetings from Colombia. bye and 73

Digipeater code is loaded.  If the LSTAT contains
d:1 the digipeater is on, o.w., it is off.  There will times
when it must be off.  Use and enjoy! 73 de BM

LUSAT-1>LSTAT:

I P:0x1A77 o:262 1:6649 f:9535, d:1

*** CONNECTED to N8AM VIA LUSAT-1

LUSAT-1>TIME-1:

PHT: uptime is 073/12:59:29.  Time is Mon Feb 26 03:52:08 1990

fb n8am de Andy in Houston

LUSAT-1>AMARG:

Digipeater is OFF.  Will be uploading a bug fix.

73 de BM

LUSAT-1>TIME-1:

PHT: uptime is 073/13:01:39.  Time is Mon Feb 26 03:54:18 1990

LUSAT-1>TLM:


21:96 22:7D 23:36 24:2C 25:30 26:00 27:00 28:00 29:00 2A:00 2B:00
2C:00 2D:31 2E:01 2F:9E 30:9E 31:9F 32:66 33:00 34:A4 35:A6 36:C4
37:9F 38:BC 39:A5 3A:A4 3B:FF 3C:03
25E918EA


LUSAT-1>TLM:

00:64 01:79 02:70 03:5F 04:6C 05:7F 06:70 07:84 08:6A 09:77 0A:A4
0B:A8 0C:EA 0D:D9 0E:01 0F:45 10:D6 11:84 12:00 13:01 14:B4 15:A3
16:80 17:7A 18:78 19:7B 1A:7C 1B:44 1C:73 1D:75 1E:2A 1F:5D 20:83
25E918EA
```

or VGA graphics. For information on program availability, you can call AMSAT at (301) 589-6062 or write to: AMSAT Software Exchange, 850 Sligo Ave. #600, Silver Springs MD 20910.

The Dove Scare

In mid-March, work on BBS software for L-O-19 and P-O-16 came to a halt. The computer on DOVE-OSCAR-17 had stopped, and one of the 2 meter transmitters was "key down" with no data coming from the satellite. AMSAT Director Bob McGwier N4HY and AMSAT Brazil (BRAMSAT) President Junior de Castro PY2BJO futilely sent reset commands to DOVE.

The uplink command frequency for DOVE is within the 2 meter band. With one of the satellite's 2 meter transmitters continuously sending a carrier, the desense of the command receiver is quite significant. Bob N4HY asked Dave W5UN for help. Located just south of Houston, Dave has the world's largest privately-owned 2 meter array with over 32 dBi gain. With one kW of transmitter output, the effective radiated power of Dave's incredible system approaches two megawatts. *[Ed. note: W5UN's moonbounce antenna system was wiped out by a tornado shortly after this attempt!]*

They planned the uplink reset attempts during a time when the satellite was just going into darkness (eclipse). The transmitter output would be weakened as the system voltage dropped, but the command receiver would still be functioning.

It worked as predicted. Dave's system was able to over-power the satellite's transmitter and command it to re-set. When the now-silent DOVE came within range of Harold NK6K, one of the satellite design engineers, he immediately began sending battery-charging rate commands and transmitter-state commands to the satellite. Later, N4HY sent the command to turn on the Mode S 2.4 GHz transmitter. Bill K0RZ listened from his home in Colorado and relayed information as Bob continued to upload code to DOVE from New Jersey.

The effort to completely redo the code in DOVE's computer precluded any immediate return to service on 2 meters. The satellite designers did not want any repeat of the computer latch-up problem. As N4HY said, "This has been a harrowing experience (for many) and once again, these robust little cubes take a lickin' and keep on tickin'!"

ROBOT Caller

Your response to the construction topic featured in the April "Hamsats" column has been exceptional. The three-chip ROBOT-CALLER circuit works well and has given many RS-satellite operators a chance to make ROBOT autotransponder contacts via RS-10 without using difficult keyers or RF-noisy computers. Photo B shows one version of the simple circuit.

The most common complaint about the project has been the difficulty many have had in finding an EPROM burner to program the CW message "RS10 DE 'your call' AR". If you would like to have an EPROM for your ROBOT CALLER, but you don't have access to a burner, I will make a custom-programmed EPROM using your callsign for $9. I'm not set up for mass production, but I can provide this service on a limited basis. Contact me at the address above.

Homing In

Continued from page 50

Since I wrote last month's column, the HF Homer (see the April "Homing In") has proven its worth in tracking down the source of serious 20 meter QRM in Orange County, California. Auxiliary members followed the same documentation procedures.

These successes may seem like only a drop in the bucket, but don't lose your perspective. Sure, malicious interference is a federal offense, but only because amateur radio is under federal jurisdiction.

Most of the time, willful QRM doesn't constitute a danger to life and property. That's one reason that it's hard to get the FCC and the US Attorney to take jammers to court. The case has to be severe and continuing to get a high priority.

As everywhere else in life, different people perceive things differently. Hams tend to react as if all jamming were a form of electronic terrorism. But to the non-ham world, including many FCC staffers, our on-the-air spats aren't much different from a family feud. To them, a belch or a cuss word in the middle of a net is not comparable to grand larceny. It's more like spray-paint graffiti.

Now don't get me wrong—I'm not saying we should let non-life-threatening offenses go unchallenged. Let's DF them and stop them, either with friendly persuasion or the government's big stick. But we must not let the miscreants bring our nets to a screeching halt, with everybody spending time bemoaning the problem.

Mum's the Word

If you're part of the Auxiliary's RDF team, go about your work quietly. Don't get on the air and talk about it. That kind of fanfare just turns the hunt into a cat-and-mouse game.

If you're not on the RDF team, you shouldn't talk about the presence or absence of hunters, either. When a heckler attacks your net or QSO, don't acknowledge his presence in any way. Don't threaten him, berate him, answer him, or even mention him.

Any acknowledgment of the interloper gives him what he wants and encourages him to continue harassing you. This entices other jammers to join in, resulting in total bedlam. Many VOLMON members refuse to get involved if the victims do not ignore the jammers, and I don't blame them.

Always remember that the goal of all OO/AA activities is compliance, not revenge. VOLMON's actions are intended only to eliminate violations of Part 97 rules. Don't try to use the Auxiliary to "get even" with someone for personal injustices of the past.

Simple RDF gear does a very effective job in the VOLMON program, and I hope you're getting your setup together. If you want to join the Auxiliary or discuss the heckler on your net, please don't call me. Your ARRL section manager handles those tasks. But I welcome your letters with specific inquiries and ideas about all kinds of RDF equipment, particularly when they include an SASE.

73 Review

by W. Max Adams W5PFG and Donald F. Brooks W5ORW.

Pipo Communications P-7 DTMF pad.

A quick and easy analog-to-digital tone converter.

Pipo Communications
PO Box 2020
Pollock Pines, CA 95726
(916) 644-5444
Price Class: $60

Dual tone multiple frequency (DTMF) signalling came to amateur radio from the world's most used device, the telephone. DTMF, in this application, uses eight "odd" voice band frequencies arranged in a row-column matrix. Operator selections, when a push switch is pressed, produces a composite two-tone or dual signal. "Odd" is used to describe the DTMF frequencies since they are not harmonically related frequencies.

Push switches are arranged in four rows of three (or four) columns, and assigned numeric digits one through zero and symbols, such as the * (star) and # (pound). The fourth column provides an additional four DTMF signals, labeled A, B, C, and D, which are used for special signalling applications. Although individual tone frequencies may vary in different countries, the keypad matrix arrangement, is an international standard. Precise (+/− 1.5%) transmit and (+/− 2.0%) receive frequencies do not easily produce distortion product (sum or difference) frequencies—distortion products can cause "false" signalling.

Contemporary amateur radio VHF and UHF equipment often includes a DTMF keypad, installed as part of the main unit or as an accessory on hand-held microphones. Homebrewing hams often add a DTMF keypad and design new devices to improve their older equipment or their operating capability. DTMF integrated circuits provide inexpensive "central office quality" DTMF tone transmit and receive features. Pipo Communications, Inc., manufactures ready-to-go DTMF assemblies, easily adapted to any HF, VHF, UHF, or SHF radio, or even to special signalling devices and test equipment. Major specifications for various Pipo PK-series keyboards are shown in Table 1. Use your Reader Service card to obtain complete specifications.

Don Brooks W5ORW, a local solder-burning home-brew expert, wanted mobile DTMF signalling from his old pick-up truck. He always keeps one eye on the other driver(s) and uses the other eye as necessary. I forwarded a Pipo Communications Model P-7 keypad to Don, which was provided by *73 Amateur Radio Magazine*.

Don writes: "A hand mike with DTMF was of little concern when I purchased my '7625' several years ago, since our local repeater did not have an auto-patch. Later, however, the Anderson County and Palestine ARC installed a local area machine equipped with auto-patch, which started my search for some mobile DTMF. I finally adapted a Dallas Sidewalk Sale (flea market) telephone handset tone pad for use with the 7625's four-pin audio input connector. I wired the fourth pin for transceiver PTT and used the existing mike input, ground, and +9 VDC to power mobile DTMF from my truck. It sat on the dashboard telephone and fell off every time I turned a corner.

"When I received the Pipo Model P-7, my first idea was to attach it to the back of the hand mike, but nothing is as simple and easy as it first appears on paper. This required microphone wiring changes, making it a nonstandard device, and an adaptor to flatten out the uneven back of the microphone.

"Mulling over the DTMF problem, I came upon a junk-box telephone wall mounting outlet box with a nice small connector and miniature four-conductor cable. 'AHA!' I thought. Here is the solution! I will mount the P-7 on the wall box and use the old red telephone cable already connected to the 7625.

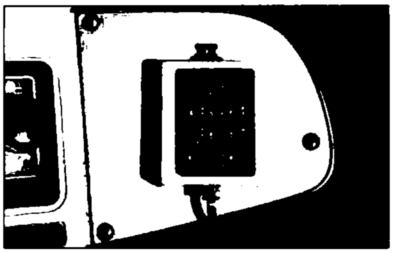


Photo A. Close-up view of W5ORW's Pipo P-7 keypad. Note PTT push switch on top edge and cable connection on bottom edge.

"I mounted a red button SPST momentary push switch on the top of the wall box, leaving the connector on the bottom. This way I could press the PTT switch with my big right thumb and play the keypad with my remaining push switch pushers." (Don was not lucky enough to get a Pipo dash K model with a PTT holding relay and adjustable interdigit dialing delay feature).

"I tested the assembly before it was installed. I connected an O-scope to the Pipo output and observed each DTMF signal and found very clean composite two-tone waveforms. I also could not see any difference in output signal levels. I adjusted the output signal level to equal that of the microphone as I bellowed a loud *Ahhhhhhhhhh* in front of it." (Output level is adjustable through a small hole in the bottom edge of the Pipo unit).

"I used double-stick plastic tape to fasten the assembly to the dashboard and I connected the output/power cable. I brought up our 'finicky' auto-patch on the first try!

"This project provides a safe, easy to use (while driving) adaptation add-on to my older model radio. The positive detent of the push switches makes operation easy while watching the road, especially in traffic or at night."

Three of Pipo's many fine features merit special mention. First, Pipo's data sheets are among the best that I have seen in 48 years of amateur radio. They include a complete description of the features, power connections, level setting directions, output circuit details, mounting, physical dimensions (with a drilling template included with each unit), and service/repair information. Second, Pipo's P series DTMF keyboards operate with 8.5 to 16 VDC, and use only 0.1μA standby (idle) current and 20 mA maximum operating current when a push switch is pressed. Third, the unit's low output circuit impedance allows it to interface with most low and high input impedance transmitters or other equipment, with sufficient power to permit losses due to load circuit impedance or resistance.

I know anyone interested in obtaining a DTMF keypad will be more than satisfied with the offerings from Pipo Communications.

Table 1. Some of Pipo Communications P Series DTMF tone generator specifications.

Keys	Steel
Contacts	Sealed gold dome, waterproof
Volt Operating Range	8.5–16 VDC
Temperature Operating Range	−22°–+160° F.
Output	+2dB at 600Ω (3V PP) at IC pin 16
External Keying	IC pins 2 & 10 serve as source driver (3–9 VDC at 1–3 mA)
DTMF Frequencies	Standard with −0.73 to + 0.74% error range
Dimensions	P-7V: 1.50"(W), 2.16"(V)
Features	Automatic number identification, 10 number memory dial

The SFA on 15 meters

Does the job without drawing the neighbors' attention.

by David Younker KA8OGD

While driving to work one day, I listened to several apartment-dwelling hams bemoaning the lack of space for, and/or regulations against, antennas at their residence.

I listened for a time, then broke in to describe an antenna that I had used in similar circumstances: a shortened, loaded vertical dipole. I'd used it on 6 meter FM, but a variation of the design could easily be built for 15 or 10 meters.

Cut and Match

While a loaded vertical dipole combined with low power is not likely to get you DXCC overnight, it gives an easy and inconspicuous way for the condo-dweller to get on the air. And the way propagation's been going these days, you will likely make many fine DX contacts on it.

This antenna is shrunk to one-third the size of a normal dipole, and is narrowband at around 100 kHz between the 2:1 SWR points. You can cut and adjust it to the frequency you normally operate on, and use an antenna matcher where you normally don't.

I started out with a full-size wire dipole for 15 meters, simply to have a reference point for the mutilations to come. Eleven feet, three inches brought the SWR down to 1:5 to 1 at my desired frequency of 21.1 MHz. I removed half of the dipole and replaced it with a PVC pipe 18" long x 3" in diameter. Other forms you have at hand—e.g., wood, a Plexiglas tube, a quart beer bottle, the neck from the junior op's guitar—would work fine.

Building the Coils

If you use the PVC pipe, wrap approximately 22 turns of heavy #16-12 wire, spaced ¼" between turns. Attach the coil to the half dipole and test. Once you get the SWR down to an acceptable level, remove the coil and start on the other element.

I used a 3' length of 1 ¼" aluminum tubing, an 18" length of 1" PVC pipe, and another 18" of aluminum tubing. Space the two pieces of tubing 6 inches apart on the PVC pipe, drill, and install a bolt long enough to go through the tubing, plus enough to spare for the nut and one turn of wire.

Wind turns of the same size wire on the upper coil that you used on the bottom coil. Test and adjust as necessary. You can use small size wire, but the heavier wire will allow a greater frequency excursion before the SWR rises too much.

Wrap the assembled coils with electrician's tape to keep the turns from slipping. Attach the coil and element to a 4" x 6" piece of Plexiglas, attach coax, and bolt the assembly to a block of wood about 2" x 2". Now just stick it out the window, mount it vertically with the short coil towards the ground and load it up!

Operating Hints

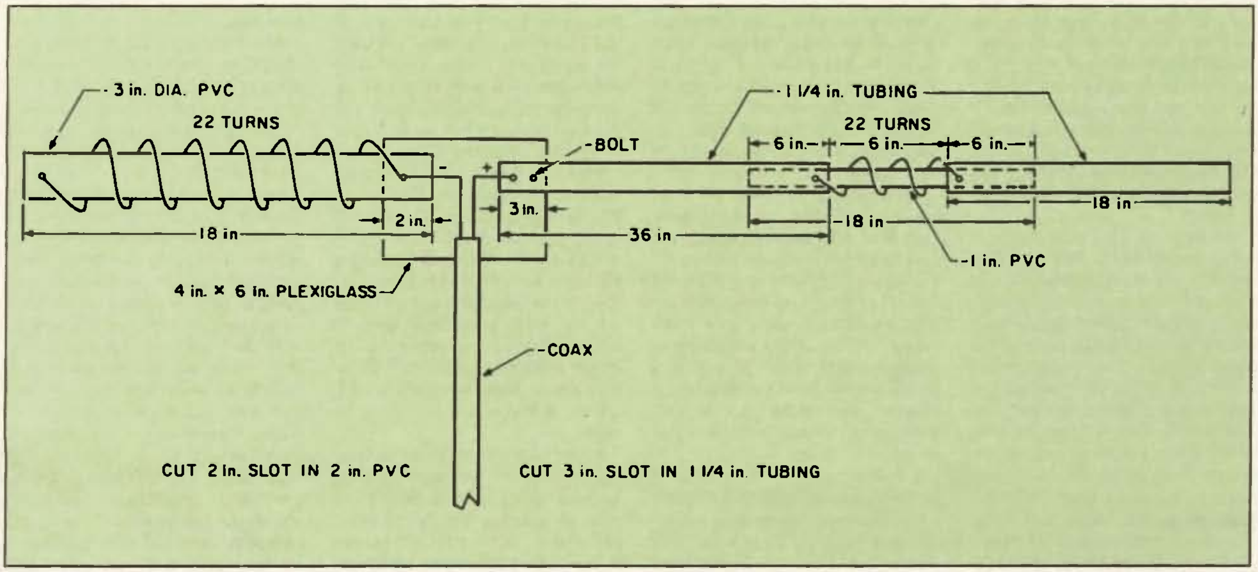
If the outside of the building is metallic, the SWR will rise. Make adjustments on the lower coil. However, a metallic exterior also acts as a reflector and gives the antenna some directionality.

Conclusion

Cost was approximately $3, most of which went for the 18" PVC pipe for the lower coil. The Plexiglas came from the junk box, as did the wire for the coils. This is definitely a quick and cheap way to get out on 15m.

What does SFA stand for? Short, Fat Antenna!

David Younker KA8OGD may be reached at 8763 Royalton Rd., Amanda OH 43102.



15m SFA construction plan.

Number 26 on your Feedback card

ASK KABOOM

The Tech Answer Man

Michael Geier KB1UM
PO Box 64766
S. Burlington VT 05406

Dead or Alive

Last month we explored the two basic types of DC power supplies, linear and switching. This month, let's look at what it takes to fix them.

Typically, power supply malfunctions come in two flavors. Either the supply's output is dead, or it is there but the voltage is incorrect. Often, it will be too high, and may contain significant ripple.

First, let's look at the case of a dead linear supply. There are several possible causes. A part simply may have gone, or a short in the circuit being powered by the supply (the "load") may have attempted to draw too much current. More often, the latter is the case. The first thing to check is the fuse. If it has blown, it's a dead giveaway that something has shorted. If you've got a few spares, try changing the fuse and turning the rig on. Most likely, the fuse will just blow again.

Never put in an overrated fuse. It won't fix anything. All you'll do is cause more damage, and perhaps even a fire! With a good fuse installed, disconnect the load and see if the output voltage comes back. Naturally, do your disconnecting with the power off and the line cord pulled from the wall. Remember: AC wall current is fatal and must *never* be treated lightly.

If the supply appears to be working with no load, then there is very likely a problem somewhere else, and the supply may be fine. It is possible, however, that the original problem has caused some damage to the supply, in which case attempts to draw the normal current will result in loss of voltage or regulation, or high ripple. If that's the case, the likely culprit is the "series pass" regulating transistor or IC through which all the current passes. In fact, any time you find a shorted load, it makes sense to check the pass transistor, as it will often be shorted or open as well. Don't just assume that because there is voltage, the supply is working properly.

Now might also be a good time to try to find the short in the load (the radio) and fix it, so that you can use it to test the supply. (Some regulators won't work properly without at least a small load.) If a resistance check from the load's DC power input line to ground shows zero ohms, you can be sure something has gone. In that case, look especially for shorted power-handling components such as output transistors. Another possibility is a large electrolytic capacitor placed across the DC input. Unless you can see burn marks or blown printed circuit board traces, you'll have to disconnect each suspected part and test it separately. The test is easy, though. Just look for a dead short, zero ohms.

Getting back to the supply, if it is still not working, check that fuse again. If it's gone, you have a short somewhere in the supply. If not, then something, most likely the series pass transistor, is open. To find a short, pull the plug, discharge the filter capacitors (short them with a 10-ohm resistor followed by a direct lead to ground) and do resistance checks of the rectifiers, filter caps, and any other component going to ground. For an open, plug the supply in and do voltage checks, starting with the output of the bridge rectifiers and continuing on toward the supply's output. When the voltage disappears, you've found your problem.

Now That's a Switch

Linear supplies with switching regulators are a bit harder, but not that much. Follow the same procedures to find a short, and pay extra attention to the switching transistor used to chop the power.

For an open, check that you have voltage at the input (collector or emitter) of the switching transistor, where the raw DC power enters. If the transistor shows no activity, check its base for pulses coming from the regulator. If they're there, the transistor is probably bad. If they're not, the regulator IC is the likely culprit.

True switching power supplies present a different set of problems. First of all, they can be dangerous to work on. Significant parts of their circuits are connected directly to the AC line, rather than being transformer-isolated, as with a linear supply. If you have a 1:1 AC isolation transformer or a variac, use it. If not, be *extremely* careful to avoid contact with the circuit. Keep one hand in your pocket, wear shoes, and consider wearing rubber gloves.

A switching supply is much like a switching regulator, except that there's a transformer in the middle of the circuit and the whole thing looks more complicated. There may be protection circuits, and sometimes a failed one can kill the whole supply. In any event, if the thing blows fuses, you'll have to start by doing unpowered resistance checks (don't forget to pull that plug and discharge the caps). Take a good look at the chopping transistor, where the raw DC power is turned into pulses capable of being passed through the transformer. These transistors do most of the work in switching supplies, and are frequent causes of short-circuit failure. When you find the bad part, check the parts around it, because it may have drawn heavy current through them and damaged them. Emitter resistors are especially vulnerable to this.

As I mentioned, switching supplies often have protection circuits built in. The idea is to prevent supply destruction or too much voltage at the output (which could harm the load) in the event of a part failure or a strong power line spike. A common form of protection circuit is the "crowbar," which places a short across an intermediate point in the supply, causing the fuse to blow. That's one of the many reasons you should never try using an overrated fuse; you could defeat the protection system and make matters much worse.

> ***"True switching power supplies present a different set of problems. First of all, they can be dangerous to work on."***

Sometimes these protection devices fail, and it looks like the supply itself has a short. Look for SCRs, transistors and diodes which feed back from the output of the supply. Some will go to the regulator IC. Those are probably not the ones you want. Others will go back near the chopping transistor, and this is what you are looking for. Check anything that goes to ground.

If the supply is dead but not blowing fuses, something is open, just as with a linear supply. In this case, though, a bad regulator IC, shorted, open or otherwise, can keep the chopping transistor turned off (and effectively open). If the transistor is good but there are no pulses at its base, then it's a good bet that the regulator IC is bad. In normal operation, the duty cycle of the pulses changes to accomplish regulation, but they should always be there.

A few words about parts replacement: some of the parts in these supplies have special properties and must be replaced with factory parts, not generic substitutes. Often, this is true of the chopping transistor and the disc capacitors surrounding it. Almost always, these parts will be specially marked with warnings on the schematic. Don't play games here. Use of the wrong parts can result in supply or radio damage, or even fire. If you need one of these components, order it from the manufacturer.

The Mysterious Mr. Switch

Switching power supplies are something of a mysterious art. The ideas seem straightforward, but actually getting the things to work reliably can be quite difficult. You may see odd-looking parts and circuits which seem to make no sense. There is great variation from design to design. And sometimes, inexplicable repeat failures occur. I remember one of the first consumer products to use a switching supply. It was a small color TV that came out around 1970. Most of them were great. Occasionally, though, one would blow its supply. No matter how many times it was fixed, it would keep doing it. You could replace every part in the circuit, and it would die again a month later. The only cure was complete replacement of the supply. No one, not even the manufacturer, ever figured it out. Fortunately, the art has significantly advanced since those days. Today's designs are remarkably reliable, as proven by the hundreds of thousands, perhaps millions, of switchers humming along year after year in desktop computers.

Now, let's look at a letter:

Dear Kaboom,

Is it possible to hook a FAX machine up to an HF or FM VHF rig? Seems to me it would be a great way to send written information back and forth. How about using a phone patch to connect it?

Signed,
Just the fax, please

Dear Just,

Sounds like a great idea! The normal telephone bandwidth is about the same as we use (less than 3 kHz), so it seems reasonable. There are other considerations, though. Phone lines have far less phase distortion and noise than HF, and they are also full duplex, or two-way. Modern FAX machines signal each other synchronously. That is, one beeps and the other answers before they commence communications. With some diddling, though, I don't see why it couldn't be done, at least on VHF. You may have to use a slow baud rate, but most faxes offer several speeds. Have any of you readers out there tried this? Let me know, and I'll pass the info along. Who knows, it may even lead to an interesting column.

By the way, I haven't been getting a great many appropriate letters lately. If you've got any questions relating to solid state gear and/or general troubleshooting, send 'em in. See you next month.

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

Is This Really What The PC Was Invented For?

We hams and RTTYophiles deal in digital communication. Never before, I should think, in the history of communications, has there been so great a push to get anyone with a computer on-line, as there is now by a certain consumer-oriented service—namely, Prodigy.

Plastered all over the place, in popular magazines, on the radio, and on television, are the ads for the Prodigy service, always with the tag line, "Finally, what the PC was invented for." Well, I tried the service, and I came away with a bit of an opinion in answer to the above.

First, the Good

Prodigy represents an easy, painless way for the average computer user to get on-line. Little is needed in the way of communications expertise. The Prodigy program is easily installed on a hard disk drive, or you can run it from floppies. It is not copy protected, so making a working backup is simple. The entire program is menu driven, with choices simply and directly available at every step.

There really are enough features and services available on-line to tempt even the most resistant potential user. News services, sports lines, stock tickers, weather forecasts, and other up-to-the minute information services are available, as well as special interest group forums. I won't try to list them here, since the roster keeps growing. Suffice it to say that the probability is high that you will find some of interest.

There is also the availability of interfacing with local merchants and banks, depending on where you live. Here in Baltimore, on-line banking and shopping services are available, albeit for a fee, with several institutions. For the individual who has difficulty traveling, this could be a lifesaver.

Prodigy is cheap. Really! For less than ten dollars a month, you get unlimited access to the system. Assuming you do not use on-line banking or shopping services, which may generate additional charges, this is about the lowest cost commercial service you will find.

Hard to Grasp

Although I liked much about Prodigy, there are certain facets of its construction that really bother me. To begin with, logging onto the system requires a password composed of a seemingly random group of letters and numbers. A typical one might be something like ASL112B. Why? Further, there is no way for the system to store the password and enter it automatically. While other on-line services, such as CompuServe and Delphi, require a password, my terminal program will store it and serve it up at the requested time. Not Prodigy, where I must type it in by hand every time. I fail to see why, in my home, on my computer, in my den, I am forced to act as though I were on a public terminal.

While there are all kinds of useful facts and figures you can punch up on the screen, for the most part, there is no way to save any of it. There is neither a facility to save any data to disk, nor one to print it out. Even a crude *PrtSc* attempt will fail. If you access material to help your child on her term paper, you are forced to grab a pencil and pad to write down the information.

Prodigy is slow! Even running at 2400 baud, the packet protocol makes the wait for each screen utter agony. Although the attempt is made at creative lines, graphics, and shadowing, the tradeoff for the overhead makes me glad I'm not paying per minute.

Prodigy tries to be pretty, but it just misses the mark. The screens on my EGA display lacked any snap or vibrancy, with the widely spaced display lines characteristic of a CGA display. The colors seemed to be low-intensity tones. This may be okay for CGA, but for EGA or VGA, blech!

Although Prodigy is an on-line service, it differs from other such services in the absence of facilities for uploading or downloading files and programs. There just aren't any. So, if you are looking for the latest in shareware for your PC, look elsewhere.

While Prodigy is marketed nationwide, I am sure that many of you have heard by now that it's not *available* nationwide. Local service is available only to major cities. Even here in Baltimore, not a small city by most standards, there is no Baltimore number; one must dial into a suburban county to gain access. With certain areas of the metropolitan area unable to dial into such areas without a toll charge, this does change the price of the service somewhat.

The Answer

As I said, the biggest thing Prodigy has going for it is the ease of use. Many, if not all, of the utilities and features offered on Prodigy are also available on larger systems. What Prodigy adds, however, is a relatively foolproof way to access that information. Further, it does its job at a very affordable out-of-pocket cost.

Things begin to cloud, though, with the introduction of such products as the CompuServe Information Manager. This "front end" program hides CompuServe's complicated syntax behind a windowing, menu driven environment. Yes, CompuServe is more expensive than Prodigy, but you get what you pay for.

Other terminal programs, such as Procomm, Crosstalk, or my favorite, QModem, allow easy access to services, and the printing out or downloading of information. Why users of Prodigy should be denied such basic functions is beyond me.

Each screen in the Prodigy service is complemented by an advertisement featuring a product or service the user may be interested in. These ads doubtless generate revenue, but they detract from the speed of the system since they often include complex graphics. Why not allow free access, using the Prodigy software with the ads present, but offer the option of accessing the system with a conventional terminal program and charging for time? If such access were to become available, free of graphics overhead, packet switching, and other constraints imposed by the system, it might attract "power users" to the service.

". . . an easy, painless way for the average computer user to get on-line."

Why can't a routine be added to allow data to be saved? Either a print-screen or save-data-to-disk option would be nice. It sure would make it possible to use the database for something more than just to satisfy curiosity.

Any critique or review would be incomplete, I suppose, if it did not include at least a few ideas or suggestions for improving what the reviewer feels is wrong. The preceding comments are offered in that vein. If you have used Prodigy, I would be interested in hearing your viewpoint. I understand from some of my writing buddies that Prodigy has been reticent to grant interviews or answer some of these questions. Maybe this piece will generate some such information.

Chips Ahoy!

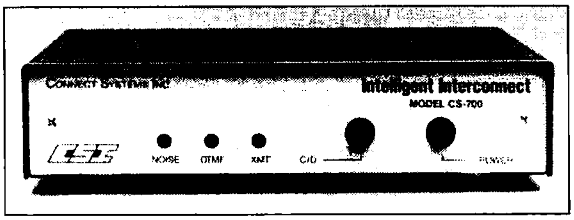
Several items have crossed my desk in the way of thoughts, ideas, or requests for simple projects that would be appealing to the RTTYophile. I am open to suggestions from the congregation. Any thoughts or concepts for one-night, interesting projects would be appreciated. Either a project itself or a question—"How about a device to. . ."—is fine.

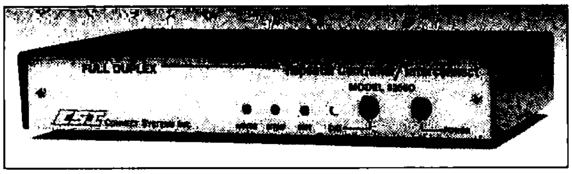
As always, comments or questions may be addressed to me via postal service (still a bargain at only two bits) at the above address, or via CompuServe (ppn 75036,2501) or Delphi (username MARCWA3AJR). And, by the way, if I haven't said it lately, thanks to all of you for making "RTTY Loop" one of *73's* top features! 73

Number 28 on your Feedback card

NEW PRODUCTS

Compiled by Hope Currier





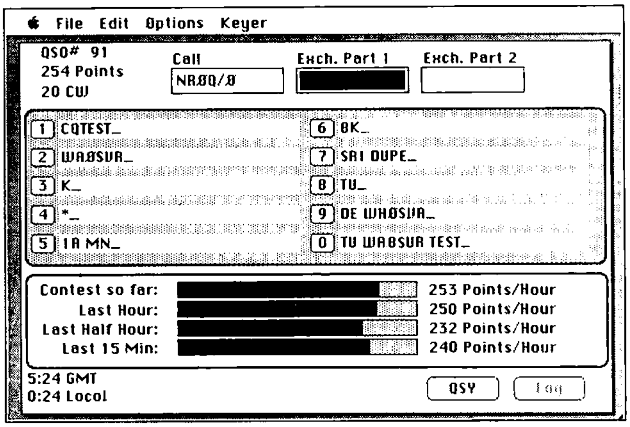
PRODUCTS OF THE MONTH

CONNECT SYSTEMS INC.

The new Model CS-700 from Connect Systems, Inc. is a Simplex Base Station Interconnect that provides user-selectable VOX Enhanced Sampling (sampling rate reduced while land party is speaking) or VOX Controlled Sampling (no sampling while land party is speaking). The latter mode is similar to using a straight VOX patch. This is the first low cost interconnect to include features such as autodialing, re-dial, fully regenerated DTMF (or pulse) dialing, automatic busy/dialtone disconnect and user-programmable CW ID. The suggested retail price is $360.

A second new product from Connect Systems, the Model 8200 Full-Duplex Interconnect and Repeater Controller, can be user-programmed into four selectable operating modes: Full-Duplex Patch, Semi-Duplex Patch, Semi-Duplex Privacy Mode, and Repeater Controller with Duplex Patch (perfect for club systems). A built-in keyboard and digital display give the user complete control of all features and operating modes. A partial list of new features includes: 90 phone number auto-dialer, last number re-dial, remote hook-flash, keyboard programmable CW ID, powerful toll protection, 1–6 digit access code, 1–6 digit secret toll override code, telephone remote base, remote-controlled relay, regenerated tone/pulse dialing and user-selectable courtesy beep. Options include a plug-in CTCSS board that converts all modes to CTCSS operation (32 selectable tones) and ANI software that allows the local or remote programming of up to 50 separate 1–6 digit autopatch access codes. The Model 8200 retails for $550.

For more information on both of these products contact *Connect Systems Inc., 2064 Eastman Ave. #113, Ventura CA 93003. (805) 642-7184.* Or circle Reader Service No. 201.



SYSTEM ONE CONTROL, INC.

System One Control announces the release of **FDlog!** version 1.5, contest logging software for the Macintosh. The original program offers online logging and fast dupe checking functions plus statistical bar graphs and a CW memory keyer. Version 1.5 adds a full-featured digitized voice memory keyer capable of speaking the other station's call and serial number in the operator's own voice. Log and dupe sheets can be printed after the contest, and their information may be put on diskettes for use by word processor, spreadsheet or database programs for the regular station log. You need a Macintosh 512KE or newer, and System 6.02 or newer.

The FDlog version 1.5 is priced at $50 plus $2.00 for shipping from *System One Control, Inc., 3900 85th Ave. N., Suite 200, Brooklyn Park MN 55443. (612) 424-2772.* Or circle Reader Service No. 203.

OPTOELECTRONICS

The new Model 2210-A Personal Frequency Finder/Counter is a test instrument that will fit in a toolbox or in the palm of your hand. It measures 4" x 3.5" x 1" (14 cubic inches) and weighs only 9 ounces. Despite its small size, the Model 2210-A specifies an operating range from 10 Hz to 2.4 GHz and is useful to 2.8 GHz. It detects and displays two overlapping frequency ranges: 10 Hz–12 MHz and 10 MHz–2.4 GHz, with resolution of 1 Hz and 100 Hz respectively. The accuracy is ±1 PPM.

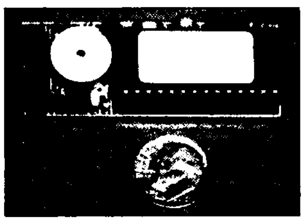
The Model 2210-A is priced at $220. Contact *Optoelectronics, 5821 N.E. 14th Ave., Fort Lauderdale FL 33334. (800) 327-5912; (305) 771-2050.* Or circle Reader Service No. 204.

BAYLIN PUBLICATIONS

World Satellite TV and Scrambling Methods—The Technician's Handbook by Frank Baylin, Richard Maddox and John McCormac is a text for technicians, satellite professionals and curious do-it-yourselfers. The authors have explored all components of home satellite systems from the perspective of a technician who wants to understand their design, operation and repair. Circuit and block diagrams of most components are presented and clearly explained throughout the handbook.

Nearly one third of this book is devoted to an in-depth study of broadcast formats including NTSC, PAL, SECAM and MAC, digital audio and techniques, as well as basic scrambling and encryption methods. The book also includes a discussion of current American and European current TV technologies and chapters on troubleshooting and setting up a test bench.

This book is available for $40 plus $2 S & H from *Baylin Publications, 1905 Mariposa, Boulder CO 80302. (303) 449-4551.* Or circle Reader Service No. 206.



A & A ENGINEERING

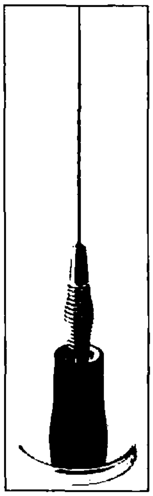
The Signal Sentry from A & A Engineering is a microprocessor-controlled DTMF decoder with program and store capabilities. It can be user-programmed to store and remember the caller's ID number and eight distinct notification numbers. It is small enough to fit into most radios, including some HTs. The Signal Sentry needs 6 to 16 VDC and uses only 12µA when in the sleep mode and just 12mA when a call notification is in progress. This unit can also be used as a radio remote con-

continued on p. 64

Continued from p. 62
troller. It provides serial output of all 16 DTMF tones for computer use.

The Signal Sentry is priced at $90 for the assembled and tested unit (#173-ASY) and $70 for the kit version (#173-KIT), plus $3.50 S & H per order. Each unit comes with an 18-page instruction manual. Contact *A & A Engineering, 2521 W. LaPalma, Unit K, Anaheim CA 92801. (714) 952-2114.* Or circle Reader Service No. 202.

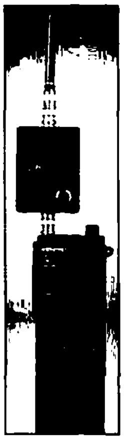
CUSHCRAFT CORP.



The CS28M magmount antenna is an ideal companion for a 10 meter mobile transceiver. It is a new adaptation of the Cushcraft/Signals mobile antennas recognized by professional users around the world for their rugged looks and dependability. The antenna comes with a 49" stainless steel whip and spring, a standard ¾" (brass base) 90 pound pull, chrome-plated magnet, Mylar™ pad and 15 feet of quality RG58AU with PL259 connector.

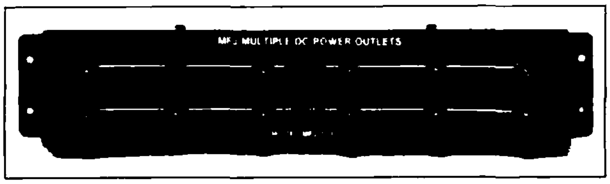
The suggested retail price is $60. Contact *Cushcraft Corporation. P.O. Box 4680, 48 Perimeter Road, Manchester NH 03108. (603) 627-7877.* Or circle Reader Service No. 209.

J.I.M. Professional Series



The J.I.M. M100 low-noise wideband GaAsFET preamplifier covers the frequency range from 24 MHz to 2150 MHz. To ensure best possible performance, three switchable bandpass filters are included. With full built-in RF switching, this preamplifier is suitable for both receive and transmit applications. It has BNC connectors that let you connect simply to your favorite transceivers, scanning receivers, handhelds, etc., and to the existing antenna on top of the unit. The M100 will also be of interest to the technician because it can be used with oscilloscopes, spectrum analyzers and similar test equipment.

The suggested retail price is US$114. Contact *NEVADA, 189 London Road, North End, Portsmouth, Hampshire P02 9AE, U.K.; FAX: (0705) 690626.*

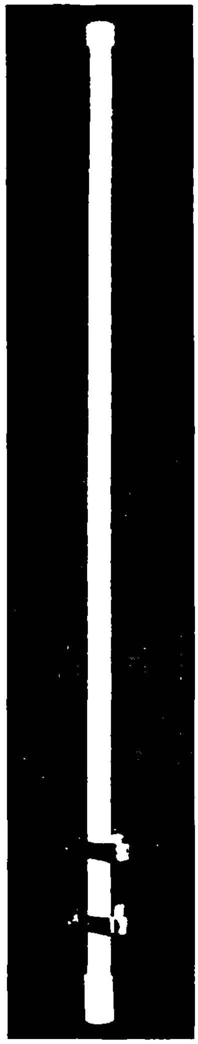


MFJ

The new MFJ-1112 Multiple DC Power Outlet saves you space and money by giving you six pairs of heavy-duty binding posts for connecting your accessories. It connects directly to your 12 VDC power supply. RF bypassing keeps RF out of the power supply from the DC line outlet. The cabinet measures 13½" x 2¾" x 2½". You also get MFJ's one-year guarantee.

The price is $25. Contact *MFJ, P.O. Box 494, Mississippi State MS 39762. (601) 323-5869, (800) 647-1800.* Or circle Reader Service No. 208.

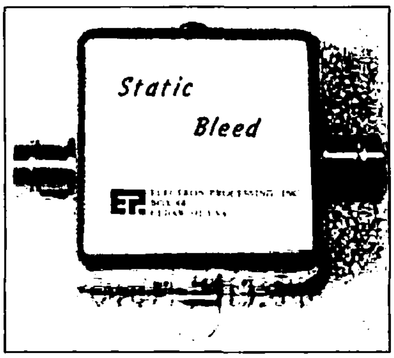
ELECTRON PROCESSING, INC.



The Scanner Stick from Electron Processing, Inc. is a low cost, quality antenna designed to provide scanner owners with excellent reception in an antenna that won't come apart the first windy day. The Scanner Stick receives all popular scanner frequencies between 30 and 1000 MHz. It is encased in a continuous PVC tube. It is only 35" long and comes completely assembled with mounting clamps for masts up to 2" in diameter. A female UHF socket (mate to PL259) is provided for connection to your antenna feedline.

The Static Bleed, also from Electron Processing, Inc., is designed to shunt to ground the high voltages that can develop on wire antennas, causing arcing, poor reception, and/or equipment damage. It works on antenna systems from 0.1 MHz to 30 MHz. Simply connect the antenna cable and ground wire. No power source is necessary for operation.

The Scanner Stick and the Static Bleed are priced at $30 each, with quantity discounts available. Contact *Electron Processing, Inc., P.O. Box 68, Cedar MI 49621. (616) 228-7020.* Or circle Reader Service No. 207.

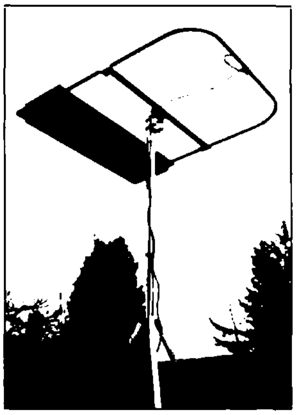


AEA

The new AEA HF IsoLoop™ antenna's compact design makes it an ideal attic or balconey antenna. It is square and measures three feet per side. The small size makes it ideal for portable operation. Its balanced feed system prevents feedline radiation, reducing the potential for interference.

The IsoLoop tunes continuously from 14 to 30 MHz and is rated to 150 watts. Typical SWR is 1.5:1 or less over the entire frequency range, depending on the immediate environment. The antenna is tuned remotely and the control box is supplied with the antenna.

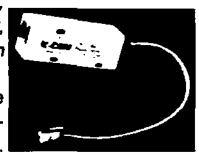
The suggested retail price for the IsoLoop is $380. For more information contact *AEA, 2006-196th St. SW, P.O. Box 2160, Lynnwood WA 98036. (206) 775-7373.* Or circle Reader Service No. 205.



K-COM

K-COM has introduced a new line of filters designed to fight telephone interference from amateur radio transmitters and amplifiers. The inline devices provide deep RF attenuation within the 3–30 MHz range. Model RF-1 uses modular connectors for fast and simple attachment to telephones and modular jacks. Model RF-2 allows the user option of filter installation at any point within telephone wiring, including protector housings, service entrance and inside jacks.

The RF-1 is priced at $12, the RF-2 at $7. S & H is $1. Contact *K-COM, P.O. Box 82, Randolph OH 44265.* Or circle Reader Service No. 211.



Memories

Dr. Hess takes a look backward for the seventh time.

by Dr. William C. Hess W6CK

[The subtitle of this article refers to the fact that Dr. Hess has authored six previous articles for 73, all with a nostalgic theme and a special emphasis on the fantastic and flamboyant early-day operation of radio station KGCX. The efforts of the owner of that station to deceive the United States Government regarding the operation of KGCX, which even included the staging of "masquerades" constitutes hilarious and interesting reading, apparently greatly enjoyed by our readers, judging by their responses in our "Letters to the Editor" section, and the fact that they wrote from all over the world and awarded a $100 First Prize for the best article in the June, 1979 issue, to Dr. Hess.—Ed.]

In 1943, I was still employed by the Great Northern Railway as a station agent and telegrapher in North Dakota, earning the princely sum of sixty-six cents for every hour worked. "Worked" may be a poor choice of words, since only 30 minutes per day was all that was required to do the work at a small station.

I was already a college graduate and had plans to enter some profession in which my labor would be more handsomely rewarded, if I resumed my education and attended graduate school for an additional four years.

All railroads were suffering a terrific shortage of telegraphers and station agents. Most of the agents were drafted into the armed services. The situation became so acute that any man who, as a Boy Scout, had learned the International Morse code, was considered a candidate for employment as a telegrapher. Unfortunately, in that type of code, eleven letters of the alphabet were represented by a different combination of dots and dashes. The American Morse code was used by the railroads ever since the invention of telegraphy in 1844. Apparently, these men who had been slightly trained in the Boy Scout code, were expected to decipher the eleven different letters of the American code by some mysterious process, such as clairvoyance.

One summer, a man visited his uncle, who was a railroad station agent. His uncle made no claim whatsoever to having been trained in any code known to man, and vigorously denied knowing anything about a station agent's duties. He was nevertheless hired as a station agent because he had been *exposed* to a railroad for three months, and like a pair of spectacles with both lenses missing, was still better than nothing at all.

When a very elderly man named Willheimer, who actually had once been a Western Union telegrapher, showed up at the Minot, North Dakota headquarters of the Great Northern, officials there looked heavenward and gave thanks to the Supreme Being. Mr. Willheimer was given a sketchy examination and dispatched on the first available train to Pillsbury, North Dakota. This station had lacked an agent to supervise it for the past month, since all the unassigned agents and telegraphers had gone to war.

Mr. Willheimer quickly proceeded to establish one of the most consistent records ever compiled by a railroad agent. Everything he did was absolutely, incredibly wrong. In addition, his record is also unique in another respect: He was the only Great Northern Railroad agent ever to establish a cafeteria in a depot. All depots of that railroad were built with a wooden molding about 3 inches wide which projected from the inside walls. If one desired to set a standard size can of vegetables, fruit, etc., on this molding, it was just the right width for that purpose. Mr. Willheimer so desired, and after he had resided in the depot for a couple of months, where he slept and prepared his own meals, the molding in its entire length of the office was completely loaded with partially opened cans of vegetables and fruit.

Clever Mr. Willheimer did not completely cut the top of each can out with his can opener, but instead left about an inch of metal intact on each can cover to serve as a "hinge." The can cover could be raised to the necessary level to seal the can again. The moldings were about four feet above the floor. So, when it was time for breakfast, lunch, or dinner, all the old gent had to do was to grab a teaspoon and walk down the cafeteria line. He would sample a couple of spoons of pork and beans, a portion of sliced beets a little further on, ad infinitum until he reached the dessert section at the end of the line. There he could enjoy some Queen Anne cherries or perhaps some crushed pineapple topped with a Maraschino cherry to complete his meal.

He never had any dishes to wash; all he had to do was take a small piece of the toilet tissue, provided by the railroad and "dry clean" the spoon he had used.

No housewife in history has ever simplified the process of easily preparing meals to the degree that Mr. Willheimer did. Nor has any housewife ever been able to offer the tremendous variety of foods at any one meal, such as was available at the Willheimer Cafeteria.

From afar, I can hear some reader say, "That idea wouldn't work. The food in the cans would spoil in a day or two."

No, it would **not**. Not in the cold climate of North Dakota, unless it was July and August and perhaps late June and early September. Mr. Willheimer's cafeteria operated during the cold months of October, November, December, and January 1944, when it suddenly ceased operations, for reasons which will be explained shortly. A Mr. Kneisel (of whom more mention will be made later) once performed an experiment in the depot at Palermo, North Dakota, where he was the station agent. That depot was one of many which stood on pilings (conveniently

made from telegrapher poles) about six feet or more high, so that the station platform would be on the same level as the railroad track. If the outdoor temperature on a winter day was thirty degrees below zero, the wind chill factor, caused by the ever-present northwest wind blowing under the depot floor, decreased it to about seventy degrees below zero.

Kneisel fired up the lignite coal stove in "his" depot until the stove pipe glowed cherry red. He then placed a tomato can full of water in the corner of the waiting room furthest from the stove. It wasn't long before a layer of ice appeared on the top of the can, and later the water froze into a solid block of ice.

Seated in the telegrapher's chair, with the chair in just the right spot, a person could look up through a hole in the ceiling of the depot and see the stars in the Dakota sky.

So, it is readily apparent that Willheimer's canned fruits and vegetables were along the cold walls of the Pillsbury depot. During the fall and winter, the food was in more danger of freezing than it was of spoiling. Elevated from the ice cold floor, the temperature of the food probably remained at around forty degrees, an ideal temperture for food storage.

Finally, Mr. Willheimer's misdeeds in the performance of his duties reached a level which the railroad could no longer tolerate. Yes, they were still desperately in need of station agents. But they weren't *that* desperate, so they gave Mr. Willheimer a considerably less than Honorable Discharge and told him, "Please, please don't ever apply for employment anywhere on the Great Northern again."

Thus, Mr. Willheimer's shaky voice vanished from the Dispatcher's telephone, and his equally shaky sending on the telegraph circuits, was heard no more.

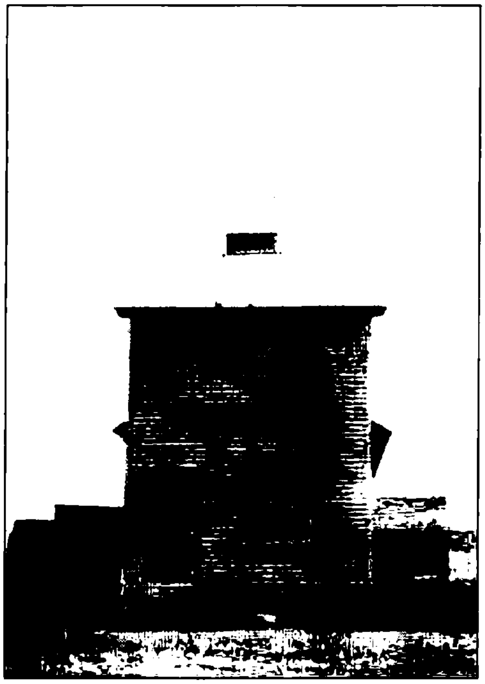
By the very strangest of coincidences, almost at the same time that the Great Northern said farewell to Mr. Willheimer, a Traveling Auditor (of which there were about ten on the G.N. system) retired. The man appointed to take his place was named Wiltheimer.

A Traveling Auditor's position is above the status and salary of a station agent. It includes a lovely expense account to cover the costs of constant traveling, hotel rooms, meals, etc. The accounts of every station in the whole railroad system needed to be checked by the auditor.

The amazing similarity between the names Willheimer and Wiltheimer presented just too great an opportunity for me not to have some fun with this situation.

In addition to each station having a couple of telegraph circuits, the stations on the main lines had a telephone system known as the "message phone." These telephone lines were owned 100% by the railroad and had nothing whatsoever to do with the Bell System or General Telephone. On these telephone lines, one listened through a leather-covered spring steel headband with a single headphone attached. To speak, one trompped on a foot switch that was conveniently located beneath the telegraph table. When this line was not being used for official business, it could (like a farmer's telephone line) be used by any number of station agents for "caboose track talk" (discussion of current events on the railroad).

One afternoon, a group of four agents, including myself, were "gossipping" on the line. During all of Mr. Kneisel long years on the railroad he had had great ambitions of becoming a Traveling Auditor. He was well-posted on all aspects of Station Accounting and was 110% honest. In short, the railroad could not have found a better man anywhere



This ridiculous picture is the result of Ed Krebsbach and Joe Jacobs having seen radio station towers mounted on top of fifteen story buildings in their travels to Seattle, Minneapolis, etc. and "wanting to be just like the big boys" straddled this old farm windmill tower on the peaked roof of the tiny Vida bank.

to promote to the position of Traveling Auditor. However, in gaining promotion on any railroad, it was largely a matter of *who* you knew, rather than *how much* you knew.

The subject of the telephone conversation took place shortly after Mr. Willheimer was disconnected from the Great Northern's payroll. Seeking to have some fun, I said to the other three men listening on the message phone, "What do you fellows think of the company appointing that guy who was at Pillsbury Traveling Auditor?"

Mr. Kneisel, agent at the station next to mine, shouted **"What!"** so loudly into the telephone mouthpiece I might have heard him without benefit of the telephone.

I said, "Sure, he is going to be the new Traveling Auditor." All three men expressed disbelief that this could possibly be true, whereupon I said "You don't hear him on the phones or telegraph wires any more?" They had to admit this was true, and I then said "Of course not, he's gone to St. Paul to learn the auditor's code (a system of code words, such as 'tabasco,' which has a hidden meaning to the Chief Auditor in St. Paul), and to get a Jim Clinton suit, and an auditor's briefcase. Furthermore, he will be out here checking up on you guys soon."

The listening men still expressed doubt that Mr. Willheimer could have ever been promoted to such an exalted position while poor Mr. Kneisel's talents remained unrecognized. I said, "All right, you guys, listen to the telegraph wire and I'll prove it to you."

At that time, John Atkinson, a friend of mine, was employed in the railroad's Minot Relay Office, a railroad message center. He was privy to messages concerning almost everything that was occurring on the railroad, and thus was well-informed about promotions, etc. We used to send telegraph messages to each other at a high rate of speed, perhaps fifty words per minute.

When I told my three friends on the message phone to listen to the telegraph circuit, Atkinson happened to be on one of the circuits calling a station for which he had a message. I broke in on the circuit and asked, "John, what's the name of the new auditor that's just been appointed?" Atkinson ripped the name "Wiltheimer" back at fifty words per minute.

In American Morse code, the letter "T" is represented by a single dash, while the letter "L" is represented by a slightly longer dash. The three men listening on both the telephone and the telegraph were good to average telegraphers, but they failed to notice the very slight difference between the words "Willheimer and Wilteimer," especially when sent at a high rate of speed they never used themselves.

I then returned to the telephone and said to the men, "Well, do you believe me now? You heard it direct from headquarters, didn't you?" They agreed it must be true.

I continued the conversation by saying, "Now, in the future when I tell you guys something, I don't want you to argue with me about it. If I tell you that a pony can pull a freight train, don't start arguing with me about it, just find the harness and hitch him up."

Mr. Kneisel tossed and turned in his sleep and slept very poorly for about three weeks until an Official Bulletin was issued by the railroad announcing that a Mr. Wiltheimer (not Willheimer) had been appointed Traveling Auditor. Of course, the first name and initial of the man were different from that of the ancient gent who had been at Pillsbury. Mr. Kneisel realized he had been the victim of a practical joke.

Adventures of Joe Jacobs

Joe Jacobs, a young man living on his father's ranch in eastern Montana, was keen of mind and hand. He was to become well known in the upper Midwest for his inven-

tions of the Jacobs Windcharger and the Frye service station gasoline pump. Admiral Byrd took Jacobs Windchargers with him on his expeditions to the South Pole. His brother, Marcellus, was also of an inventive nature, and eventually the brothers were granted a total of thirty US patents. They established a factory in Minneapolis with 200 employees. During the years of operation, it sold some twenty million dollars' worth of windchargers, an impressive accomplishment, all stemming from the tinkering of two young men with windchargers on a ranch in Montana.

In 1924, Joe built a 7½ watt transmitter and operated it on the ranch. It was on the standard broadcast band without benefit of a government license. No call letters were used; the station came on the air with the announcement that "This is the Voice of Cow Creek," and the brothers rang a cow bell frequently during the broadcasts. Their broadcast music was produced by holding the single-button mike in front of the family Victrola. During this year of illegal operation, Joe was not fined $500 nor imprisoned for six months as the law provides and in fact, he never heard a word from the Federal government.

In October 1925, he sold the illegitimate station to E.E. Krebsbach, the village banker in the nearby hamlet of Vida (population, 25) for $125. About the same time, a druggist in a nearby town sold Atwater Kent radios in his drug store. The druggist was displeased with the competition provided by the Jacobs brothers (they built radios on the ranch and sold them, thereby assuring themselves of listeners), and wrote to the Department of Commerce in Seattle informing them that an unlicensed radio station was operating in Vida, Montana.

At that time, the Department of Commerce supervised radio stations. The net result was the loss of Joe's two-letter call, 7 TF, but he was not otherwise punished. However, Krebsbach induced all his friends to write to the Radio Inspector in Seattle, describing how terribly bad Jacobs felt about the loss of his ham license, and in about two weeks, Joe's license was given back to him, though with the less desirable call letters 7AHN. Nothing whatsoever was done to Krebsbach, and he kept right on broadcasting for an additional year without benefit of station license nor a licensed First Class operator. In October 1926, he secured a license seven days after applying for it, with the call letters KGCX.

Krebsbach received a telegram in May 1928, from the Radio Inspector at Seattle. It read that he would arrive in Vida in three days to inspect KGCX radio station. This was cause for *panic time* in the Krebsbach home, since KGCX did not have a licensed First Class operator as required by law.

Understandably alarmed, Krebsbach summoned a young man named Johnson, who held the required license, to come to Vida and pretend that he was KGCX's resident engineer.

Johnson lived in Havre, Montana, 231 miles from Vida. His presence in Vida had to be explained logically somehow to the Inspector, since KGCX was only on the air one hour per day, and had no commercials and no income.

Krebsbach and the village storekeeper "invented" a job for Johnson. He was wrapped in a grocer's apron and put to work busily selling groceries in a store. Shortly before noon, when it was time for KGCX's daily one-hour broadcast, Johnson trudged the short distance from the village store to the bank where KGCX was located. He was still dressed in his bogus grocer's apron to give the Inspector the impression that he worked full time in the village store except for the one hour each day he was required to be on duty at the radio station.

Joe Jacobs took his First Class operator's examination while the Inspector was in Vida, and passed it. Johnson had to go back to the store to sell groceries all afternoon in order to play his role when his one-hour stint at KGCX was finished.

That evening, when Krebsbach, the Inspector, and Johnson (who had to return to high school at Havre) arrived at the south shore of the wide Missouri River in the outskirts of Wolf Point, Montana, the Inspector and Johnson boarded the White City Ferry, since it was making its last trip of the day across the river.

The Inspector shook hands with Krebsbach and bade him goodbye. Unfortunately, Johnson did the same. It was rather strange for a resident engineer to bid his boss goodbye without any explanation. Obviously, in order to have played his role satisfactorily, Johnson should have merely said, "See you tomorrow" to Krebsbach. It would have made it appear that he was merely going to Wolf Point for an evening of recreation, and that he would, of course, be on duty at KGCX the next day.

The Old KGCX

What would you think if you were listening to a regular broadcast station which was playing a spirited tune, such as "The Saints Go Marching In," and suddenly the tempo slowed down so much that the music sounded like a funeral dirge? You would, of course, think that something had gone wrong with the station's turntable or tape machine. But what if the announcer stated that the temperture in the studio was only zero degrees, and asked the listeners to please stand by for a few minutes while he placed the phonograph motor on the stove to warm it up and thin the oil? Would you wonder what kind of a cockamania radio station you were listening to? Of course you would. But that is exactly the announcement you would often hear if you were listening to KGCX at Vida during the winters of 1925 through 1928.

Now let Mr. Krebsbach tell you in his own words about some of the trials and tribulations of operating his peanut-whistle radio station at Vida. "When the station went 'haywire,' Mr. Jacobs would come up from the ranch and put it in operation again. We were fortunate to have only about one breakdown every six months or so. While the operation was a novelty for a while, it soon became a strain on the nerves, my pocket book, and everything else, including the good wife. Day after day, I would eat my meals on the run, always with my pocket watch on the dinner table, watching for the time of 12:15 to arrive. Very often, I would not have finished my meal and would run into the transmitter room, throw the switch and put on a phonograph record and go back to finish my lunch.

"Everything went fairly smoothly until the colder weather arrived. We had the transmitter set up in one of the unheated rooms at the back of the bank, and it may have as well been set up at the North Pole, for all the torture from the cold that I suffered from during the broadcasts. The most trouble was with the phonograph. At first, we operated it with the mechanism inside the phonograph cabinet, but when the temperture in the room got down to zero degrees, it was necessary to remove the mechanism and place it on a table. It could be handled easily and set on the stove just before broadcast time to 'thaw out' the heavy oil. Even so, when it was really cold outside, a 'time out' was said, and the thing was set on the stove again for a while."

KGCX moved from Vida to Wolf Point in 1929, and from Wolf Point to Sidney, Montana, in 1942 with its respected five-kilowatt operation. It has enjoyed prosperity since World War II, a condition to which it was not accustomed previously in its life.

The electrical power in the North Dakota town in which I was born was somewhat substandard, since it was 110 volts DC and only "on" from sunset to midnight, when it would "flicker" twice as a warning that it would cease entirely in two minutes after midnight.

If one acted extremely quickly, it was possible during earlier hours of the evening to turn off the switch on the drop-cord hanging in the center of one's bedroom and jump into bed before the illumination ceased, since the carbon filaments in the lamp bulbs used at that time still provided some light while they were cooling off, even though the "juice" had been turned off.

Monday and Tuesday mornings, the current was on so that housewives could do their washing and ironing.

The DC generator at the light plant could light the whole town satisfactorily, but it wasn't powerful enough to do that and at the same time operate the carbon arc light in the movie projector at the local theater. Since the same man owned both the light plant and the theater, the movies were shown on Saturday evenings. The owner would open a big knife switch, cutting off the electricity to the western half of the town, while the following Saturday the eastern side of town was cut off.

At that time (circa 1915), radio was not the main event of North Dakota or practically anywhere else. The main entertainment of the area was "card parties" with, of course, refreshments being served about midnight.

To those residents of the town who complained bitterly to the light plant owner about the lack of electricity the previous Saturday evening, he had a ready answer: "It's all your own fault—you were supposed to be at the movies!!!"

ABOVE AND BEYOND

VHF and Above Operation

C.L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake
San Diego CA 92119

CW EPROM Keyer

I hope the information I provided in the last two issues on basic gain blocks got you in the building mood. You can build so many different things using MMIC amplifiers, it can make your head swim. Recently, Kerry N6IZW, a member of our group, has tried placing several amplifiers in series, building up about 80 dB of gain. The internal noise built up by this string of amplifiers can be used as a signal source for testing with a spectrum analyzer. When connected to a test circuit, the response curve is displayed on the analyzer as if you were using a sweeper.

News from my shack includes some great openings on 6 meters, and new test equipment. The latter was mostly constructed from bargain items in dire need of repair. The price can be very attractive, especially when the unit is fully restored to operating condition.

A good example is my HP-5360 frequency counter, picked up at a flea market. I just located the last item needed for complete operation of the counter: a 5375A keyboard, which Kerry N6IZW repaired. With the keyboard, the HP-5360 is capable of doing program calculations using all three ports on the counter. Input A is good to 10 MHz, B is good to 320 MHz, and the plug-in is good up to 18 GHz. This counter has proven to be quite valuable on numerous projects. It was used extensively to develop a phase-lock circuit to stabilize the Frequency West "Brick" type microwave oscillators to within 100 Hz at 10 GHz. We are in the process of writing up an article on the phase-lock circuit, and will have it out soon.

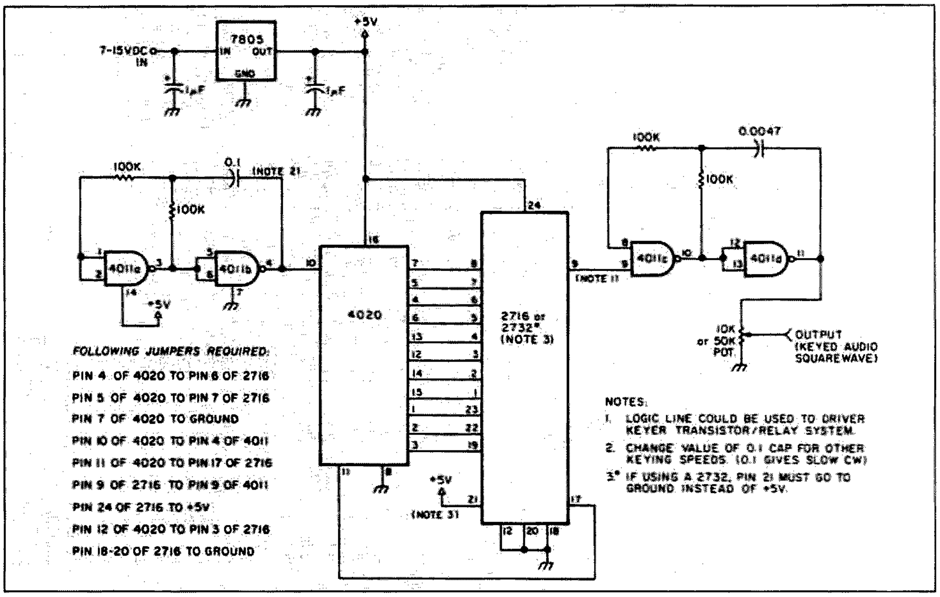


Figure 1. Circuit for the CW IDer.

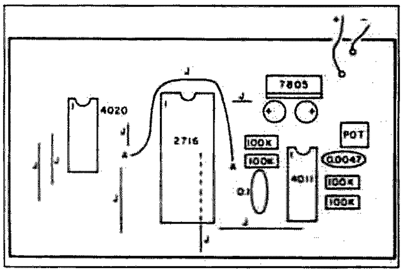


Figure 2. Parts placement, component side.

Programmable CW IDer

This month I'll describe a simple, one-evening construction project that can be used on your microwave wideband FM transceiver. The unit is a CW IDer that can be custom programmed with your callsign. You can use this reliable unit with many different types of microwave transmitters or on a remote beacon.

First, some background. Normally, the microwave carrier is transmitted to a distant location in a first attempt to set up communications. The receiving end rotates his antenna back and forth, trying to locate the signal. In many cases the signal being detected is quite weak due to path loss and highly directive dish antennas that are not in proper alignment with each other.

The mechanical alignment is set up with maps and compass bearings to the distant station. You can check vertical alignment with the horizon by trying to copy local beacons, if available. Another method is to attach a small sight tube to your dish to confirm horizon alignment. These methods all combine to help remove pointing errors. Now you are down to the real nitty-gritty of finding the distant signal in the noise. After listening so long to noise, you begin to hear signals that are not there. I guess this could be called the post mental DX depression.

Finding Signals in the Noise

Since signals in the noise are difficult to locate, we use tones to aid location. When a signal is modulated with something other than voice or CW, such as a solid or fluttering tone, it can be found at very low levels and enhances the microwave signal. Mechanically adjust your antenna until you're receiving the strongest signal, then request that the other station make small adjustments in his antenna alignment, hopefully to improve signal strength further. This usually takes about two or three orientations. When the antennas have been properly aligned, you can switch to voice modulation or CW for identification and confirmation. This streamlines contest operation. Running the CW IDer lets others know who the signals belong to. When many stations operate near each other, it promotes a good neighbor policy.

So let's get on with the construction of the CW IDer. The meat and potatoes of the IDer is contained in a preprogrammed 2716 EPROM. This EPROM contains your callsign and a reset command to give a constantly repeating CW output spaced every 15 to 30 seconds. The advantage in using this EPROM is that you can turn the power off, and your program is still resident in the chip. Applying DC power activates your program. Change the EPROM with a differently programmed EPROM and you change your message.

Other types of ID systems are more complex and require you to key in your callsign each time you wish to use it. When power is turned off, you must reset the message. Also, these units are a little larger because of memory storage. I feel the EPROM is the way to go because it's inexpensive, small, and easy to build. For those who don't build from scratch, I will make a kit of parts available with PC board and preprogrammed EPROM.

The EPROM is programmed in serial format. The data is clocked out in the same manner by the 4020 ripple counter chip, and the speed is set by the clock rate. The scheme used is three bits equal a "dah," while one bit is a "dit." Letters are spaced by 4 data bits, and word separation is equal to 7 bits. In Table 1 is an example of the programming for my callsign.

How the Circuit Works

The clock is made from two sections of a 4011 NAND gate. The speed is set

Continued on page 73

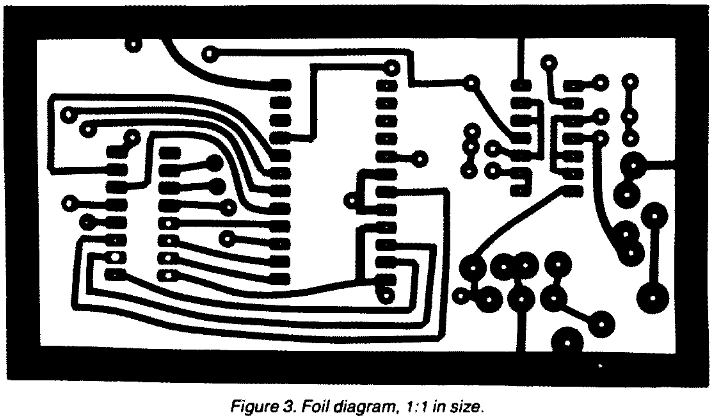


Figure 3. Foil diagram, 1:1 in size.

Above and Beyond

Continued from page 70

by the 100k ohm resistor and the 0.1 µF capacitor. Increasing the capacitor's value will decrease speed. This clock drives the 4020 ripple counter, causing the EPROM to dump its data serially. When the full string of data is dumped, such as *De WB6IGP*, an additional amount of following bits are stuffed with zeros. Generally I use about 40 bits, giving a silent period of about 10 seconds, and finish up with a code "80" input as data on the last bit to be used. This is the reset signal that starts the entire sequence over again. The other two NAND gates form an audio oscillator that is keyed on and off by the data from the EPROM. A "1" or "high" turns on the oscillator, and a "0" or "low" turns it off.

The beauty of this circuit is that the power can be turned off at any time and turned on later, restarting the CW cycle. You can identify your station quickly with a simple switching scheme.

Next month, to complete the package, I'll give the schematic for the warble tone oscillator. This unit is capable of producing the solid tone as well.

If you don't want to go through this mental balancing act of programming an EPROM and making a PC board, I will make a kit available with the board etched and ready to drill. This includes the 2716 EPROM programmed with your callsign in a format similar to that in Table 1. Variations include callsign/B for beacon service. You can program other messages, but the callsign and beacon formats are standard. The kit is $12.50 US postage paid from WB6IGP.

Mailbox Comments

Alan Rutz WA9GKA has been providing amateurs with 10 GHz microwave devices from his company, SHF Microwave Parts. Alan writes that he is running out of surplus GUNN oscillator defector units, but he has made arrangements with a GUNN manufacturer for new and used devices and information on sources. Contact Alan at: 7102 W 500 S., La Porte IN 46350.

Alan described an ATV experiment he recently finished. He replaced the electrolytic capacitor (needed to bypass the GUNN against low frequency oscillations) with a low impedance transistor. This transistor driver stage was able to provide Alan with 7 MHz bandwidth, flat within 3 dB. He was quite surprised to be able to obtain such a wide modulating bandwidth, especially with some of the very inexpensive GUNN units.

Russell in Holly, New York, is trying to locate inexpensive 22.2 GHz oscillators to test cavities. Well, Russell, that's a tough one. I know of several manufactures of 24 GHz oscillators, but the price is much higher than most experimenters would want to pay, including me. Any help out there on where to locale 22 to 24 GHz equipment? If so, drop me a line, or write: Russell Robertson, 4242 Holley Byron Rd., Holly NY 14470.

Bill N6OLD writes, "I'm experimenting with some of the California Microwave 'brick' oscillators, and have run into a few snags. I'm interested in obtaining a schematic for the phase-lock detector part of the brick. My phase detector works fine; there's enough signal that I can see the IF go thru zero beat with my scope as I vary the tune voltage. All I need now is to repair the place where the IF goes to to complete the loop. Also, if you have a crystal supplier that you recommend for the brick crystals, that would help out."

Well, Bill, I am tearing apart several California Microwave bricks and developing the schematic as I go. These three different California Microwave brick oscillators all have very similar crystal oscillator boards and drive circuitry, but all the phase-lock boards are different. I suspect the schematic will be developed shortly. Part of the problem is that California Microwave used a custom house numbered chip which I'll have to probe to determine just what is going on. It looks like a standard op amp can be used as a replacement, but this has not been tested yet. If any of you have information on this brick, I would be interested hearing from you.

Now a brief review of brick oscillators: Microwave brick oscillators are very desirable because they require little modification, and they're far cheaper than building a comparable microwave oscillator. The basic brick uses a three-stage 100 MHz crystal oscillator, coupled into a mixer circuit. The high power oscillator (about 1700 MHz) is phase-locked to the 100 MHz crystal. The mixer feeds a video amplifier IC which controls a varactor in the high power oscillator cavity. When phase-locked, the high power is a direct multiple of the 100 MHz (approximately) crystal oscillator frequency. This is multiplied in a varactor multiplier to the 10 GHz frequency range and filtered on its output. Crystals for the 100 MHz oscillator were obtained from International Crystal for about $18 each. Specify part #585132 for the Frequency West type MS-54XOL "Bricks." (More details later.)

Let's hear from you regarding new projects you would like to see developed. Or you could share something you have constructed, or send pictures of microwave VHF/UHF activities. As always I welcome questions and will answer ASAP. For a prompt reply, please enclose an SASE. 73, WB6IGP.

Table 1.
E-prom Programming Example "De WB6IGP"

D=1110101	SPACE=0000	E=01	WORDSPACE=0000000
W=0101110111	SPACE=0000	B=111010101	
SPACE=0000	6=11101010101	SPACE=00001=0101	
SPACE=0000	G=111011101	SPACE=0000P=010111011101	

LONGSPACE=00 (40 OR SO "0" BITS), and RESET BIT=80.

Number 34 on your Feedback card

73 INTERNATIONAL

edited by C.C.C.

Arnie Johnson N1BAC
103 Old Homestead Hwy.
N. Swanzey NH 03431

Notes from FN42

I have sad news this month. Last March, Gerry Fox WA2VKS relayed to me that Ken Gott VK3AKU is now a Silent Key. Ken is well-known to 73 readers as Hambassador to Australia, and to the world as the WIA Awards Manager. He was very active on the 14.226 family net, and an all-around contester and DXer. We will sorely miss him. I received a chatty letter from Ken in February, and it is printed in this column as a tribute to him. The new WIA Awards Manager will be Ken VK5QW.—Arnie N1BAC.

ROUNDUP

Denmark *From Ragnar Otterstad LA5HE/OZ8RO.* The success story behind the recent release of 18 and 24 MHz to the amateur service started some 14 years ago.

Over 180 countries are now members of the International Telecommunications Union (ITU), based in Geneva, Switzerland. Every 15 or 20 years there is a major conference to look at the frequency allocations for the numerous users of the frequency spectrum. The ITU undertakes, as an agency of the United Nations, to coordinate such work.

There are 36 services in addition to the Amateur Radio Service. Some of the more well-known are: Fixed, Mobile, Broadcast, and Radio Location. Many of the radio services could use more spectrum, and as the aspirations of people all over the world change, so do their requirements for frequencies.

Many important factors influence the political and commercial pressures on the radio spectrum. For example, when there are satellite communication problems, many governments and organizations turn their eyes to the HF spectrum. With such enormous global pressures at work, it is perhaps quite surprising that the amateur service has any bands at all! The tact that we do is because of the high reputation of radio amateurs for international goodwill and public service—especially for their technical achievements and during times of need

At the last World Administrative Radio Conference (WARC) in 1978, the amateur service gained in principle three new HF bands and many new microwave allocations. This success, for it was a great success, was due to the efforts of linking together all of the national societies. The 1979 success in winning new allocations was also due to the IARU Observer Team that spent three months in Geneva! It countered every move which was considered negative, and put forward every positive aspect of amateur radio for its benefit.

Now some excellent work by fellow amateurs volunteers, started 14 years ago, has finally reached fruition in the shape of the release of the 18 and 24 MHz bands. The moral of this story is a simple one and it concerns good long-term planning, faith in the future, and patience!

As one of the national societies of the world, it is imperative that your IARU society is strongly supported by the local ham population. Think how much more the society could do if all amateurs were members. We all know someone who is not a member, for one reason or the other—often because of a conflict of opinion with the local society several years ago, the ham has never renewed membership. But all hams continue to benefit from the society's work. Remember, the higher the membership, the stronger the representation, and the stronger the representation, the more substantial the argument.

A freeloader is someone who freely accepts all the benefits that a national society obtains or provides for the amateur service—new bands and modes, QSL bureau, liaison with licensing authorities, international representation, etc.—without paying for these services.

After all, if the resources needed to obtain new bands or preserve existing frequency allocations were paid for by larger numbers of people, each person would have to pay less! The next ITU conference to deal with frequency allocations is scheduled for 1992. Think about it!

[I have never been one to say that anyone has to belong to any organization, but I truly believe that organizations doing good things for me should be supported by me. Hams in the United States have found that commercial interests are a strong power when they want some frequency spectrum. In 1992 we are talking not just about the USA, but the world. As Rag states, "Think about it," and I would like to add, "And do something about it!"—Arnie]

Japan *From the Tokyo International Amateur Radio Association (TIARA):* There is a club for foreign hams in Japan! If you will be in the Tokyo area, you are cordially invited to visit and/or join TIARA.

TIARA was formed in 1972 by two Englishmen and two Americans with the purpose of assisting foreign hams who want to operate in Japan. Currently, we have about 80 members, both foreign and Japanese. TIARA supports all efforts toward reciprocal licensing, including the need for fair and equitable licensing fees.

Foreign radio amateurs or persons interested in ham radio are invited to attend TIARA meetings and join in club activities. We meet at 1930 JST on the last Friday of every month (except August and December) at St. Alban's Church opposite Tokyo Tower. Meetings are conducted in English and are usually followed by a social get-together. This is an excellent opportunity to get acquainted with local hams regardless of how long you will be in Japan. Hope to see you there. (TIARA, PO Box 119, Akasaka, Minato-ku, Tokyo 107, Japan. TIARA Net, Wednesday, 1200Z, 21.325. When in Japan, just phone the JARL at 947-8221 for information on TIARA activities and meetings.)

TIARA Award: Last December 1989, when the Japan Amateur Radio League (JARL) celebrated its 30th anniversary, TIARA received an award for its support of amateur radio in Japan. Presenting the award was Shozo Hara JA1AN, President of JARL. Accepting the award for TIARA was President Frank Striegl 7J1AAL/KA2TNZ.

Poland *From Henryk Zwolski SP9JPA.* Where is Poland? If you ever got a QSL card from an SP (or sometimes SN, SO, SO, SR, 3Z) station, your answer would be easy: Poland is in Europe. However, if you have a chance to talk to Polish people, they will tell you that they are still striving to be in Europe.

Drastic political changes in Eastern Europe initiated so peacefully by Poland have also influenced the amateur radio service here. Portable and mobile licenses were issued to all willing SP stations for the first time last year. The first two contest stations were heard in the 1989 CO WW, one from Krakow (SN9C) and the other from the Poznan area (SN3A).

Licensed amateurs are no longer obliged to belong to the Polish Radioamateur Union (PZK). Independent local associations have been founded. The first one registered was the Krakow Radioamateurs Club, which continues its 60-year tradition under the same name. The club members hope to reform the national organization so that it can become a federation of partners rather than a centralized structure.

Every change requires great efforts on the part of the Polish hams. Economic chaos, the initiation of free-market economy, and the implementation of human rights require assistance for the new democracy. Will it find its way to the young entrepreneurs in Krakow who have to survive and finally develop their club activities?

We have proposed several projects emphasizing the training and involvement of youngsters, which were successfully carried out in Jordan after Wayne Greene's encouragement there some twenty years ago.

The Krakow Club members are experienced in contest operations, special event stations (SN10JP, SN70KRA, SO0DXC), certificates (the Cracovia and the Child's Friend award), DXing (Cracovia DX Club) promotion (articles in local press, English phrase book for amateurs, and video programs on ham radio), technical questions (repeater to be completed soon), and national coordination (SP YL Club).

The ancient city of Krakow has many friends abroad. Krakow has nearly 20 sister cities on all the continents. What an excellent opportunity for cooperation!

Further reforms, which are expected later this year, should also revive contacts with Polish immigrants and start progress toward the Council of Europe, the international organization for the promotion of culture. We hope that the word Europe will soon lose its reference to the western part of the continent.

USSR *Info relayed by Dick Genaille W4UW:* Early last year a new radio club was formed in the USSR. The name of the organization is "Advanced Communications DX Association (ACDXA)." It was formed to promote the usual good things that radio clubs try to do, such as foster international friendship and good will, sponsor contests and expeditions, etc. The founders are Valery RA9YD and Yuri UA9YE. Both are officers of the Association.

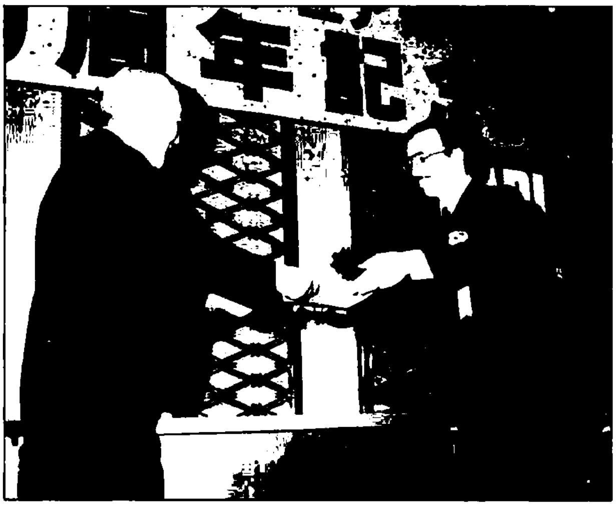
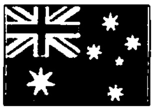


Photo A. Shozo Hara JA1AN (left), President of JARL, presenting award to TIARA, accepted by Frank Striegl (right), 7J1AAL/KA2TNZ.

Applications and information about awards offered should be sent to the awards manager: ACDXA, PO Box 1, Barnaul 656057, USSR.

[Dick passed on the list of awards that ACDXA proposes to sponsor. There are too many to list in this column, but they will be listed on the 73 BBS in the 73 INTL Special Interest Group (SIG) as "ACDXA Awards."—Arnie]

Lithuania. News flash! The first ham convention organized by the World Lithuanian Amateur Radio Net, scheduled for early June, has been postponed. Standby for further news in the July issue of *73 Magazine*.



AUSTRALIA
Ken Gott VK3AJU
38A Lansdowne Road
St. Kilda, Victoria 3183
Australia
"Silent Key"

Here we are in February, meaning that summer vacation is over for Australians, even if there's still plenty of summer left.

This was the first time in some years that I missed a visit to uninhabited Erith Island, where a group of us go camping. It's a major exercise, since we have to take all our needs with us—everything, that is, except lobster, abalone, and fish, all of which abound in the surrounding waters. And water—we don't take any of that, since we've established storage tanks in past years.

However, DV, I'll be back there next December for a few weeks, despite the fact that its topography and other factors make it a lousy place for DX.

Some pix I took a few years ago on a visit to Northwest Cape provided the cover for the February issue of *Amateur Radio Monthly. [What a cover and view!]* Although this joint US-Australian facility is best known for its VLF facilities (and hence ability to communicate with underwater submarines) it also has good all-round HF facilities. I understand that there is a similar VLF station at Cutler, Maine (USA), and that the two between them provide global coverage.

Incidentally, VK amateurs can get special permission to operate on LF. I only know of two who have ever availed themselves of the privilege. They were restricted to CW incidentally, and while on Erith, I cooperated in some of their experiments about five years ago (listening on 300 Hz or thereabouts, and replying on 3.5 MHz). However with effective radiation of only 1% of the LF station's power, it has always seemed like a mug's game to me.

WIA membership fees are on a calendar year basis (i.e., everyone pays in January), so it won't be until April that we will know the effect of a fairly steep increase in the fee. The same applies to the new membership option—a reduced fee, but without getting the monthly AR. I'm predicting that smaller circulation = less advertising revenue = smaller magazine. But we'll need to wait until April before the situation becomes clear. Meanwhile, there's a federal council meeting on Feb 10-11, with delegates coming to Melbourne from all states. Maybe that'll provide some news for *73 Magazine*. Naturally, I'll be at the meeting with pencil poised.

Heck. Pretty soon after, I'll have to start getting ready for the annual field day contest. Having won the solo 24-hour section in 1988 and 1989, I'm out to make it three in a row. The doctors have OKed me, with a couple of caveats, but this year the idea will be to win not by working harder, but by working more cleverly. . . CHEERS—Ken.

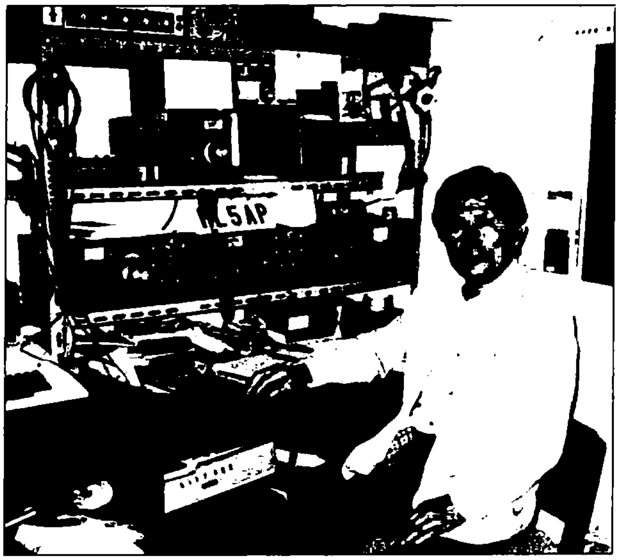
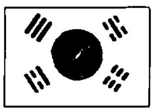


Photo B. Byong-joo Cho HL5AP, Republic of Korea Hambassador, and his new ham shack.



REPUBLIC OF KOREA
Byong-joo Cho HL5AP
PO Box 4, Haeundae
Pusan, 612-600
Korea (South)

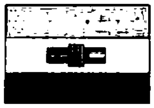
I am well after being sick for the last few months of 1989. I built a new 5-story building (which I call the "CQ Building") in February 1989 and my new shack has been completed, including an antenna tower on top of the building with a triband yagi and many dipoles.

I have been QRV on 10 and 18 MHz since October, and will be on 24 MHz soon with RTTY. I also have packet radio using an IBM-XT and MFJ-1278.

I am the oldest call holder in Korea, and a charter/life member of the Korea Amateur Radio League (KARL), as well as on the organization staff for KARL.

Even though it may be a little late by the time this gets printed, I send my best wishes for the New Year to all hams at *73* and worldwide from the "Land of the Morning Calm."

[The letter was written January 1, 1990, and arrived at 73 sometime after February 15, 1990. Is that speed, or what?—Arnie]



SOUTH AFRICA
Peter Strauss ZS6ET
PO Box 35461
Northcliff 2115
South Africa

On February 2, the Pretoria Branch of the South Africa Radio League (SARL) celebrated its 60th anniversary with a dinner. The Patron of the SARL, Mr. Johan de Villiers, and the SARL President, Reno Faber ZS6OF, were guests of honour.

In proposing a toast to the pioneers in telecommunications, Mr. de Villiers said that he was amazed at the technological developments that have taken place in amateur radio and the contributions that radio amateurs have made to the development of telecommunications.

In his address, Mr. Faber reminded the members of the branch of predictions he had made six months earlier, and how they had come true. Membership has increased 13.9% with new applications daily. Liaison with the Post Master General, and the services offered to SARL members, have never been better.

He expressed the appreciation to Mr. de Villiers for his encouragement and understanding, and to the officials for their cooperation in the creation of a new Novice licence, and the special concessions for groups like the Voortrekkers, Scouts and Girl Guides, to enable them to exchange messages during CQ Hou Koers and Jamboree on the Air, soon to be promulgated.

The Chairman of the South African Broadcasting Corporation Board, Prof. Chrislo Viljoen, addressed delegates to the Amateur Radio and Industry conference held at the Johannesburg Amateur Radio Centre on March 15 as part of Amateur Radio Week.

The conference was organised by the South African Amateur Radio Development Trust to introduce the Novice Licence concept to Industry and to enlist their support for the development of amateur radio. Professor Vilhoen discussed the important role amateur radio can play in the development of South Africa's Electronics Industry through the encouragement of young people to follow a career in that field.

[It certainly appears that the SARL is attempting to halt the decline of amateur radio license holders as reported in the February column. How about the rest of us???—Arnie.]

Radio RSA, the Voice of South Africa, broadcasted live from the SARL National Convention held on March 17. Shortwave radio personality Kathy Fitch was at the Radio RSA stand and hosted the live transmissions.

Radio amateurs licenced in their own country and planning to take up residence in South Africa for an extended period may now apply for a ZS or ZR licence, without the need to write the local examination or a CW test. This facility was in the past only available to amateurs from countries which had entered into a reciprocal agreement with South Africa. Under the new ruling, amateurs from many West and East European countries, Canada, and many countries in the Americas and the Far East including Australia and New Zealand will now be able to apply.

Applications must be addressed to the Senior Director of Telecommunications, Department of Posts and Telecommunications, Private Bag X74, Pretoria 0001. A certified copy of the original licence and, where applicable, a copy of the current receipt must be included in the application. 73

Photo C. Reno Faber ZS6OF, South Africa Radio League President.

Number 35 on your Feedback card

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The *73 Flea Market*, Barter 'n' Buy, costs you peanuts (almost)—comes to 35¢ a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

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TECH TIPS

Pearls of Tech Wisdom

TS-430S Mods from KA0SUN via KB8CI PBBS

The AGC mod on the TS-430 Kenwood to run AMTOR requires three component changes. On the IF board, find and replace capacitor C-60, a 10 mF, with a 4.7 mF. Clip one of the connections on diode D-50. Replace capacitor C-164, a 0.22 mF, with a 0.1 mF ceramic. Both D-50 and C-60 are on the upper left corner of the IF board, and are also marked on the PC board. However, C-164 is not clearly marked. It is a 0.22 mF can electrolytic near the center of the IF board. It is just below and to the right of C-149, and directly right of IC-5. Looking at the back of the board, one lead of C-164 is connected to the junction of a 47kΩ resistor, R-129, and a glass diode, D-77. These two components, soldered to the back of the board, are also not marked.

A nice touch, when speed is not important, is to put a short piece of coax to a miniature toggle switch in-line with diode D-50. This disables the mod to restore the smooth changeover from transmit to receive the 430 has normally. In CW, with D-50 clipped, the receiver kicks back to life with a sharp crack and gets annoying when the gain is really high, chasing after a weak DX station, for instance. So the switch removes diode HD-50 for AMTOR and returns it to the circuit for anything else. Beware! Everything is very tiny, very crowded, and very expensive.

from **NCARC COMMUNICATOR**

IC-2AT Mod from KA8CNI via KB8CI PBBS

I routinely use a half-wave antenna on my IC-2AT handheld. When collapsed, the antenna has the same gain (loss) as a rubber duck, while giving me greater range when fully extended. There is a certain amount of movement of the center pin of the BNC connector with the half-wave antenna on the handheld. This movement causes fatigue fracturing of the wire connecting the printed circuit board to the BNC connector. After numerous failures, I used the braid of RG-174 coax to make the connection.

First remove the BNC from the radio and break off the unused ground lug. The pin of the BNC should be placed into the end of the braid. Wrap a thin piece of *wire around* the braid 3–4 times, secure it, then solder it. Reinstall the BNC and dress the braid to the solder pad on the printed circuit board and solder. Do not heat the braid too long while soldering, as solder will be drawn up, making it stiff and subject to fatigue fracturing.

from **NCARC COMMUNICATOR**

All About Henry for the C-64

I read with interest the article by W.K. McKellips WB4DCV, "All About Henry," in the November 1988 issue of *73*. Knowing from experience how difficult it is to measure the value of coils, I immediately built the oscillator that he described, and with skepticism, anxiously awaited the results.

The program had been written for an Apple 2+ and it would not run on my Commodore 64, so I had to make a few changes. After this, I found to my surprise that it was possible to measure the small ones as well as the big ones without much trouble.

Since C1 (0.001) is important for accuracy, get it as close to 1000 pF as you can. If C1 is slightly under, you can add silver mica condensers in parallel to put it on the nose.

If the program doesn't work the first time, check to make sure you typed it in correctly. It's difficult to get all the periods, semicolons, etc., right the first time.

When you make a change in a line, be sure to press RETURN to put the change in memory. After pressing RETURN, press RUN/STOP and RESTORE at the same time, then hold the CTRL key down and press 2. You'll get a white cursor, which is more visible than the blue cursor. Type LIST to view the entire program on the screen.

If you'd like to check the program before you've built the oscillator, you can run the program by using the following procedure using the following figures. When entering 679 kHz as F1, the program will show an LS = 54.94µH. When F2 is set to 615 kHz, LX = 12.02 µH/0.01 mH. When F2 is 409 kHz, LX = 96.47 µH/0.09 mH. When F2 is set to 20 kHz, LX = 63,269.04µH/63.26 mH/0.063 H.

In the original program, line 80 has a small inverted "v." This is the up arrow to square F1. Other printers might show it in other ways. Also, CLR/HOME (in reverse field), used to clear the screen in line 5, could be shown as a heart by a Commodore MPS 801, and as a small "s" by a Blue Chip printer.

```
READY.

5 PRINT"s":REM-HOLD SHIFT AND PRESS CLR/HOME-THIS CLEARS THE SCREEN
10 REM-ALL ABOUT HENRY
15 REM-COMPLETE PROGRAM FOR LS AND UNKNOWN VALUE.(LX)-FOR COMMODORE 64
30 C=1000:REM-(C=.001)
40 PRINT"FREQUENCIES SHOULD BE IN KHZ."
50 INPUT"ENTER FREQ #1":F1:PRINT
60 IF F1=0 THEN END
70 F1=F1/1000:REM-CONVERT TO MHZ FOR FORMULA
80 LS=25330 / (1000*(F1^2))
90 LS=INT (LS*100)/100
100 PRINT: PRINT"INDUCTANCE STANDARD (LS)"LS "UHT"
110 REM 2ND PART FROM JULY '88 RADIO ELECTRONICS
120 LS=LS/1000000:F1=F1*1000
130 INPUT "ENTER FREQ #2";F2:PRINT
140 IF F2>F1 OR F2=0 THEN GOTO 10:END
142 PRINT
144 PRINT"   UNKNOWN VALUE (LX)
146 PRINT
150 LX=((F1/F2)^2-1)*LS
160 PRINT INT (LX*100000000)/100;"UHY"
170 PRINT INT (LX*100000)/100;"MHY"
180 IF LX <.01 THEN 200
190 PRINT INT (LX*1000)/1000;"HYS"
200 PRINT
210 GOTO 130

READY.
```

Figure 1. Program for LS and LX.

You must have the article, "All About Henry," to use this information. If you don't have this issue, you can request a copy directly from *73 Magazine* for a small fee.

You can also measure capacitors with a unit you can buy assembled or in kit form, as described in the July 1988 issue of *Radio Electronics*. Good luck.

Lindsey M. Riddle W5JG
New Orleans LA

QRP

Low Power Operation

Michael Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

Conversions for Field Day

The end of June brings Field Day, a great time to operate QRP. You can show the rest of hamdom just what several watts can do! This month we'll look at some simple modifications for Field Day use.

The ICOM IC-735

First, a modification to convert the popular ICOM IC-735 to QRP operation. These modifications will let you operate the IC-735 at QRP power levels down to one watt or less. **DON'T ATTEMPT THIS IF YOU ARE NOT SURE OF WHAT YOU ARE DOING!** Leave it for someone who feels secure working inside a modern transceiver.

Start by removing the bottom cover. With the radio turned upside down, find the slide switch at the rear left center. This is the switch that selects either 50 or 100 watts as the maximum output available from the transmitter. Push the switch to the rear of the radio. This is the 50 watt position.

Next, find the pot labeled R-267 at the right rear of the radio. Turn the pot to full clockwise position. This is the minimum output setting. You should now have about four watts output with the front panel control set at minimum, and about 50 watts out at maximum. R-268, located just to the right of R-267, sets the maximum power output when the front panel control is advanced to the maximum position.

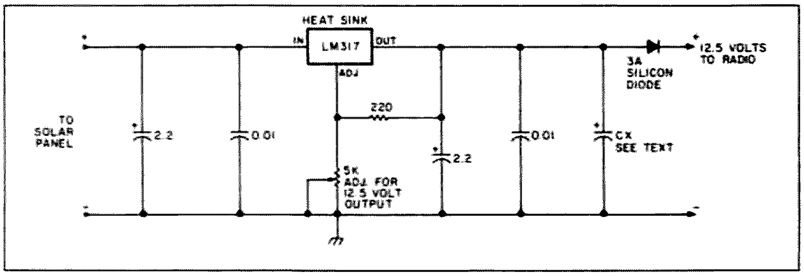
Find the pot labeled R-361 at the front left of the radio. If you want a lower power output, adjust this pot for the lower power setting desired. This adjustment is quite touchy at settings below two watts out but, if you are careful, you can get outputs down to approximately one watt. You can maintain this power level through a reasonable amount of vibration, such as while operating portable or mobile. Be aware that this adjustment will probably change the power output obtainable when the front panel control is advanced to the maximum position. For example, with R-361 adjusted to 1.9 watts, the maximum that you can get is 30 watts.

Replace the bottom cover. You should now have power control for the IC-735 while operating QRP.

The newer IC-725 can be adjusted down to QRP levels via the front-mounted drive control. You won't need to get inside this radio to modify it for QRP use.

The Ten-Tec Argosy

If you're really a glutton for punishment, how about running milliwatts for Field Day? If you have a Ten-Tec Argosy, milliwatting is easy to do.



A simple circuit for a small voltage regulator.

Remove the top cover of the Argosy. Look for the RF mixer board located in the right center of the transceiver. (In my Argosy II, the mixer board is numbered 80784-d.) On the right side of the mixer board you'll see two pots. The one we're looking for is labeled R4. Locate the power adjust switch on the rear apron of the Argosy and move it to the QRP position. Adjust R4 to control the low power output of the radio. This can be set to less than five watts output. The ALC will hold this level. That's all there is to it.

Before you replace the cover, you might want to do another simple modification to the Argosy II. If you're like me, you'll have noticed the bleed over from the meter light onto the LED display. This is most noticeable when you turn the display off to save on battery power.

The fix is simple. Cut a small piece of fishpaper to fit between the meter and the LED display board. Fishpaper is thin, stiff, nonconducting cardboard. It is also flame-resistant. You can use just about anything in place of fishpaper as long as it meets these requirements. Fashion the fishpaper to an "L" shape and it will fit nicely between the meter and the display board. Now when you turn off the LEDs you won't see the circuit board illuminated by the meter lamp.

The Century 21

If you're running a Century 21 for Field Day, this modification may be of interest to you. Using the Century 21 at QRP power levels is difficult. You can adjust the Century 21 much easier if you change out the drive control. The original control pot is a 10k **LINEAR** taper. Replace this control with a 10k **AUDIO** taper pot. You can get these at your local Radio Shack store. This makes low power settings easier. Results will vary from radio to radio. The Radio Shack pot is not an exact mechanical replacement.

You'll have to tighten the hex nut against the inner panel with the spacer loose on the pot shaft. Lacking a hex nut on the front panel isn't a problem. Just put the knob on the shaft and have a ball.

The Heath HW-9

Most of the HW-9s I've seen drift positive about three or four kHz over several hours. One of my earlier columns had some mods for curing drift in the HW-9. Some of you wrote to me saying that the mods didn't work; others said that they worked like magic. Well, here's one mod for HW-9 VFO drift.

Since diode junction capacitance varies with ambient temperature levels, two 1N914s are connected back-to-back and soldered across variable capacitor C1 (points E and GND). This procedure will shift dial calibration which can be reset by adjusting the VFO coil, L118. You might want to try different pairs of diodes to find the characteristics to best suit your needs.

Solar Power

To get a few more extra points, many QRP stations are operating with solar power. Using just the solar panel for power, without a battery for energy storage, can be a real challenge. I've always used a battery along with a solar panel for Field Day. The battery serves as the voltage regulator and it will operate the radio at night.

If this is your first time operating with solar power, remember: **NEVER CONNECT A SOLAR PANEL DIRECTLY TO A RADIO WITHOUT EITHER A VOLTAGE REGULATOR OR A BATTERY TO SERVE AS A REGULATOR.** The open circuit voltage of most photovoltaic panels approaches 20 volts. This will fry your new radio instantly.

Figure 1 shows a simple circuit for a small voltage regulator. This will hold the voltage down to a safe level for direct use by the radio. When the sun shines, the radio will operate. With the voltage regulator listed you can run about an amp of current to the load. The LM317 will go to 2 amps if heat-sinked to a larger piece of metal. I used a small heatsink and have no trouble at one amp. Don't allow the regulator to sit in the sun—you don't want to add to the heat build-up. And, of course, you must have the solar panel at the required power to run the load directly without a battery. You'll need at least a five watt panel under full sun to operate the Argonaut.

Notice the use of large capacitors at Cx. These are computer-grade units from hamfest flea markets. The capacitors will smooth out the rough spots when the sun hides behind a cloud or two for a short time. A 90,000 µF cap works quite well at both locations. The more the merrier! Allow the panel to charge up the capacitors before you connect the load. Watch the operating voltage of the capacitors at Cx. You'll need at least 30 VDC working for the panel side of the regulator, less on the load side.

Build the circuit on a piece of perfboard. You can get all the parts from the local Radio Shack store. Test the regulator by substituting a power supply for the solar panel. Adjust the supply for 20 volts. Adjust the trimmer on the regulator for 12.6 volts. That's all there is to it! Tidy things up so you won't short out the regulator and you're off.

This year at Field Day, when you turn it on, turn it down. Please send me photos of your setup.

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the August issue, we should receive it by May 31. Provide a clear, concise summary of the essential details about your Special Event.

JUNE 1-2

ALBANY GA The ARRL Georgia State Convention and Southeast Packet Conference, sponsored by the Albany ARC, will be held at the Heritage House Motel & Convention Center 5 PM-9 PM Friday, 8 AM-4 PM Saturday. All rooms $39. Reservations: *800-476-5193*. Admission $3. Tables $8 for both days. Free parking. Talk-in: 146.82, 444.5. Contact *Albany ARC, PO Box 1205, Albany GA 31702. 912-883-7910 (M-F, 9-5).*

JUNE 2

PITTSBURG KS The Pittsburg Repeater Organization, Inc. will hold its Annual Hamfest in Lincoln Center from 8 AM-3 PM. VE exams. Admission $5 includes chicken dinner. Talk-in: 146.34/.94. Contact *Kenneth L. Johnston, 2402 Wall, Joplin MO 64804. 417-623-1895.*

ATHENS GA The Athens Radio Club will hold its Annual Hamfest from 8 AM-4 PM at Sandy Creek Park. VE exams at 9 AM. Walk-ins welcome (bring license copy). Adult admission $2, children 50¢ (includes park entrance fee). Some tables available for flea market space. Talk-in: 146 745/145 and 147.225/.825. Contact *Joe Londeree KC4EJY, 404-353-8196.*

KITCHENER ONTARIO CANADA The Central Ontario Amateur Radio Fleamarket, jointly sponsored by Guelph ARC and Kitchener-Waterloo ARC, will be held at Bingeman Park 8 AM-2 PM. Opens 6 AM for vendors only. Admission $5. Vendor tables $8 per 8' space. Children 12 and under free. Talk-in: KSR 146.37/.97; ZMG 144.61/145.21, simplex 52/52. For advance tickets and table confirmations contact *Fleamarket Chairman, Ray Jennings VE3CZE, 61 Ottawa Cresc., Guelph Ont. N1E 2A8. 519-622-8342.* Make checks payable to: Central Ontario Amateur Radio Fleamarket.

KNOXVILLE TN The 24th Annual Knoxville Hamfest and Computer Fair, sponsored by the RAC of Knoxville, will be held from 8 AM-5 PM at the Convention Center at the World's Fair Park. Admission is $5. Dealer and fleamarket tables $11, includes 2 chairs. Crafts and home products also featured. VE exams. Garage parking and trailer compound available. Talk-in: W4BBB 147.30+, 145.37−, and 224.500. For table reservations contact *Frank Ambrister N4OQJ, PO Box 9605, Knoxville TN 37940. 615-933-2539.* For license exam reservations contact *Ray Adams N4BAQ, 4325 Felty Drive, Knoxville TN 37918. 615-667-5410.*

JUNE 2-3

WENATCHEE WA A Hamfest will be held at Rocky Reach Dam by the Apple City ARC. Registration fee for amateurs is $5, others $1, children under 12 free. The banquet at 6:30 PM Saturday (at the Masonic Temple) is $7 per person. Free camp and trailer space with power will be at the west side of the dam after 2 PM Friday, under Wagonmaster control. VE exams 2 PM Saturday at the Powerhouse. Talk-in: 2 meter FM 146.30/.90, 147.38/.98; 146.49 simplex. Mail registration to *Bob Lathrop, Treasurer, 919 N. Woodward Drive, Wenatchee WA 98801.* Make checks payable to Apple City Radio Club.

JUNE 3

NEWINGTON CT The Newington ARL will hold its 7th Annual Amateur Radio and Computer Flea Market from 9 AM-2 PM at the Newington High School. Indoor tables. Tailgating. Admission $3 at the door. Contact *NARL Flea Market, PO Box 165, Pleasant Valley CT 06063* (SASE, please). *203-523-0453.* For VE Exam info: *Tom Namnoum KM1O, 203-666-1615.*

QUEENS NY The Hall of Science ARC Hamfest will be held at the New York Hall of Science parking lot—Flushing Meadow Park. Doors open at 9 AM. Set up after 7:30 AM. VE exams at 10 AM. Donation, buyers $3, sellers $5 per space. Talk-in: 144.300 simplex, 223.600 repeater and 445.225 repeater. For information call at night, *Steve Greenbaum WB2KDG, 718-898-5599 or Phil Kubert N2HYE 212-777-8648.*

PRINCETON IL The Starved Rock Radio Club Hamfest will be held at the Bureau County Fairgrounds beginning at 6 AM. Advance tickets are $3.50 before May 20th and $4 at the gate. Free camping and outdoor flea market area. 8' tables indoors are $10. Talk-in: 146 355/.955 or 147.72/.12. Contact *Pete Jacobsen AA9R, 19 Briarcliff Drive, Spring Valley IL 61362-1001. 815-664-5580.*

BUTLER PA The 36th Annual "Breeze Shooters" Hamfest will be held at the Butler County Farm Show Grounds from 8 AM-4 PM. Admission is $1 at the gate. Indoor tables $10. Free tailgating. Designated handicap parking. Talk-in: 147.96/.36. Check in on 146.52. Contact *H. Rey Whanger, RD 2 Box 8, Cheswick PA 15024. 412-828-9383.*

CHELSEA MI The Chelsea ARC, Inc. will hold their 13th Annual Chelsea Swap N' Shop from 6 AM-2 PM at the Chelsea Fairgrounds. Donation: $2.50 in advance, $3 at the gate. YLs, XYLs and kids under 12 free. Table $8 per 8' space. Trunk Sale: $2 per space. Special handicap parking. Send SASE to *Robert Schantz, 416 Wilkinson Street, Chelsea MI 48118 313-475-1795.*

MANASSAS VA The Ole Virginia Hams ARC, Inc will sponsor the Manassas Hamfest and Computer Show at the William County Fairgrounds. Open to public 8 AM, tailgalers 7 AM. General admission is $5, *tailgating* $5 additional per space. All activities wheelchair accessible. Talk-in on the Manassas repeater, 146.37/.97 and 223.06/224.66. Unlimited tailgating space. For further information: Dealers contact *Joe K4FPT, 703-368-8599* For general information contact *Rosemary KI4VO, 703-361-5255.*

LANCASTER NY The Lancaster ARC will hold their 2nd Annual Hamfest at the Oepew Grove from 8 AM-4 PM. Advance tickets $3. Indoor space $4 per 8' table. Reserve early. Contact *Al Lincoln KB2FIN, 2779 Stony Point, Grand Island NY 14072*

JUNE 9

GRAND RAPIDS MI The Independent Repeater Assoc. is sponsoring its Annual Hamfestival at the 44th St. Armory from 8 AM-4 PM. Walk-in VEC exams 9 AM. Tables for dealers, sellers $4 each. Reservations with SASE only. Contact *Bruce N8IRW, 616-453-8029* or write *IRA, c/o Bruce Rittenhouse, 562 92nd St S.E., Byron Center MI 49315.*

MIOLANO MI The Central Michigan ARA will sponsor their 16th Annual Hamfest at the Midland Community Center from 8 AM-1 PM. Admission is $3. Tables $8. Talk-in: 147.000 + 0.600 MHz. Contact *CMARA Hamfest, PO Box 67, Midland MI 48640. 517-631-9228 evenings and weekends* Please SASE.

WINSTON-SALEM NC The Forsyth ARC presents its 3rd Annual Hamfest, Computer & Electronics Fair at the Benton Convention in downtown Winston-Salem. Fleamarket setup 6 AM-9 AM. Doors open at 9 AM-3 PM. Advance tickets $4, $5 at the door. Tables $10/8'. Talk-in: 146.64/.04. Send SASE to contact *Jim Rodgers N1DRI, W-S Hamfest, PO Box 11361, Winston-Salem NC 27116. 919-760-2493, 9 AM-10 PM.*

JUNE 9-10

CHEYENNE WY The SHY-WY ARC will host the Wyoming Hamfest at the Holiday Inn. VE exams. Talk-in on 146.175/.775 or 146.22/.82. Contact *Fred Dumire N7JPR, PO Box 6262, Cheyenne WY 82003.*

GRANITE CITY IL The Egyptian RC will conduct the Annual Egyptianfest at their clubgrounds on Chouteau Place Rd. from 6 AM-3 PM. VE exams Saturday nite camping is available. Advance tickets $1 each/6 for $5 or $2 each/3 for $5 at the Egyptianfest Talk-in: 146.16/.76, 146.19/.79 and 442.400 on the ERC-W9AIU repeaters. Contact *Carl Walter WB9YDK, PO Box 562, Granite City IL 62040. 618-345-6469.*

JUNE 10

WINFIELD PA The Milton and Central Susquehanna Amateur Computer and Ham Radio Clubs will host the 17th Annual Central PA Ham and Computer Fest at the Winfield Fireman's Fairgrounds from 08:00-17:00 EST. VE exams by advanced registration. Donations $4 at gate. XYLs, YLs and children free. Tailgating $1 for 6' table. Talk-in: 146.97, 147.18 and 146.52. Call or write *Jerry Williamson WA3SXQ, 10 Old Farm Lane, Milton PA 17847. 717-742-3027; or Bob Stahl KQ3KR, 452 Fourth St., Northumberland PA 17857. 717-473-7050.*

LAWSON MO Children between the ages of 8 and 14 who are accompanied by an adult relative may participate in a 43-hour field event starting at 5 PM at the Watkins Mill State Park. No fees except state park entrance fee. The Marlborough Elementary School Communications Club has organized activities in which child-parent/grandparent teams may participate. Accompanying adults who are hams may bring their own radio equipment. Limited camping spaces with electricity. Participants are responsible for their own tents, gear and food. Elementary and middle school radio clubs are invited to participate as units when accompanied by club sponsors or teachers. Contact *Chuck Bryan, Marlborough Communication Club, 1300 E. 75th St., Kansas City MO 64131. 816-926-2134. Packet address: KB0CUS @ WB0AEX.*

AKRON OH The Goodyear ARC's 23rd Annual Hamfest and Family Picnic will be held at Wingfoot Lake Park (near Akron) from 6 AM-4 PM. Admission to outside flea market is $3 per vehicle. Inside dealer area available at $6 per table (advance reservations suggested). No overnight parking, no pets, no swimming please. For tickets and info contact *William F. Dunn W8IFM, 4730 Nottingham Lane, Stow OH 44224. 216-673-6502.*

WILLOW SPRINGS IL The Six Meter Club of Chicago, Inc., is pleased to announce its 33nd Annual Hamfest. This event is to be held at Santa Fe Park beginning at 6 AM. Advance registration $3, $4 at the gate. Pavillion space is limited. A donation of $20 per table space is requested. Overnight camping not permitted by Santa Fe Park managment. Talk-in K9ONA 146.52 or K9ONA/R 37-97. Get advance reservations from *Mike Corbett K9ENZ, 606 South Fenton Ave., Romeoville IL 60441.*

JUNE 11

BOULDER CO The Boulder VE Team will be testing at 7 PM at the American Legion. Pre-registration is preferred but walk-ins are welcome. Please bring driver's license, one other ID, check or MO payable to ARRL-VEC for $4.95. If you currently have a license, bring it and a copy. If you claim credit for any test elements, bring originals of certificates of completion of an exam and a copy of the FCC 610 you submitted. Also bring soft pencils and a calculator. For info and to pre-register call *Barbara McClune N0BWS, 303-530-1872.*

JUNE 15

VERONA NY The Madison-Oneida ARC is holding VE exams at the Madison-Oneida BOCES starting at 7 PM. Talk-in on 145.37. Contact *Leonard Popyack WF2V, 315-853-8974, or on 146.79, 145.37, WF2V @ WA2TVE, or POPYACK @ TOPS20.RADC.AF.MIL.*

JUNE 17

CROWN POINT IN The Lake County ARC will sponsor its Annual Fathers' Day Hamfest in the Industrial Building of the Lake County Fairgrounds from 8 AM-2 PM. Free parking. Set-up at 6 AM. Free parking. General admission $3.50. Tables $5. VE exams with Novices free end walk-ins welcome. Talk-in on the LCARC repeater 147.00 or 146.52 simplex. Contact *Ken Brown KE9TC, 918 Chippewa, Crown Point IN 46307, or call 219-663-5035.*

FREDERICK MD The Frederick ARC will hold its Annual Hamfest at the Frederick County Fairgrounds from 8 AM-4 PM. Admission $4, tailgaters $5 for each 10' space. Wives & children free with one paid admission. Indoor tables $10. Write to *Ernie Hansen K3VVV, PO Box 589, Mt. Airy MD 21771.*

SANTA MARIA CA The Satellite ARC will hold its Annual Santa Maria Radio Swapfest and Barbecue at the Union Oil Company Newlove Picnic Grounds from 9 AM-4 PM. Tables are available at 7 AM for $3.50. Top Sirloin Barbecue at 1 PM, $7.50 for adults and $3.50 for children. VE exams, free parking. Talk-in: 146.94. Contact *Esther Miller, PO Box 5117, Vanderberg AFB CA 93437* or call *805-937-6878.*

MONROE MI The Monroe County Radio Communications Assoc. will sponsor its 1990 Hamfest at the Monroe County Fairgrounds. $3 advance, $4 at the gate. Handicap parking inside the grounds. Exhibits are wheelchair accessible. Talk-in 146.12/.72 and 223.18/224.78. Contact *Fred Lux WD8ITZ, PO Box 982, Monroe MI 48161. 313-243-1053.*

STEVENS POINT MI The Central Wisconsin RA, Ltd. is holding its Annual Swapfest at the University Center on the University of Wisconsin-Stevens Point campus. Free parking. Handicap accessible. Tables and electricity available for commercial venders. Groups and clubs dedicated to amateur radio are invited to request space for meetings. Facilities assigned on a first-come, first-served basis. Please contact *Art Wysocki N9BCA, CWRA Swapfest Chairman, 3356 April Lane, Stevens Point WI 54481. 715-344-2984.*

JUNE 23-24

LEMPSTER NH The Connecticut Valley FM Assoc will hold a Flea Market at the Dodge Hollow Campground from 9 AM-4 PM. Camping space available. Field Day operations. Talk-in: 146.160/.760 and 146.490. For info contact *Conrad Ekstrom WB1GXM, PO Box 1076, Claremont NH 03743-1076. 603-543-1389.*

SPECIAL EVENT STATIONS

JUNE 1-3

ST. LOUIS MO The Amateur Radio Operators of the St. Louis Area Council, Boy Scouts of America will operate Station K2BSA/0 from Friday 2200Z-1700Z Sunday, to commemorate Rendezvous 90, a Scout Jamboree where over 25,000 scouts will be in attendance. Frequencies: Phone 3.940, 7.290, 14.290, 21.360, 28.350; CW 3.590, 7.125, 14.070, 21.140, 28.190. For OSL send your QSL and SASE to *Richard A. Grady, 5976 Keith Place, St. Louis MO 63109.*

JUNE 2

PROVIOENCE RI The Rhode Island A.R.E.S./Red Cross Network will operate Station K1JFI from the Narragansett Bay Chapter A.R.C. State Communications Center from 1200Z-2400Z. This will be part of the First Annual RI Emergency Communications test. Frequencies: General Class 40 & 15 meter phone bands; Novice 10 meter phone band. For certificate send QSL & QSO number with an SASE (or IRC's) to *The Roger Williams VHF Society K1JFI, PO Box 40001, Providence RI 02940-0001.*

JUNE 2-3

MAOISON OH The Wireless Institute of Northern Ohio (W.I.N.O.), an organization sponsored by the Lake County ARA, will operate Station KO8O Saturday from 2300Z-0300Z on 7235 and 14235 kHz, and Sunday from 1500Z-1900Z on 14235 and 21310 kHz. The station will be located at a winery. A special 8½ by 11 QSL certificate will be available from *KO8O—WINO Weekend, 10418 Briar Hill, Kirtland OH 44094* for a legal sized SASE.

JUNE 3

NORTH OLMSTED OH West Park Radiops will operate Station W8VM beginning Saturday 0000Z-1500Z Sunday. Frequencies: 80-10m, lower portion of General phone and Novice phone on 10m; all Novice CW on 80-40-15m. Send QSL and SASE to *W8VM, c/o Glenn Williams, 513 Kenilworth Rd., Bay Village OH 44140.*

JUNE 15-17

TEXAS 1990 Smirk Party Contest #15 from Saturday 0001-2400 Sunday. Texas time. To be eligible for contest awards pay your 1989 dues. Failure to provide your name, call, and smirk # on your log will disqualify. For details contact *Lisa Lowell KA8NNO, PO Box 307, Hatfield AR 71945.*

JUNE 16-17

ISLETON CA The Isleton ARS will operate Station N6OGJ from Saturday 0000Z-2400Z Sunday to celebrate the Annual Crawdad Festival. Operation will be SSB, CW, PKT and RTTY in all lower portions of the General and Novice bands. For a certificate send a QSL and SASE to the *Isleton ARS, PO Box 801, Isleton CA 95641.* Contact *Debra Taylor N6MQQ, 415-732-8319, or Richard Teitzel N6OGJ, 916-777-6448.*

Never Say Die

Continued from page 4

rulemaking proposal was announced. This makes it impossible for a NIAC group to talk with the commissioners until this rulemaking is terminated . . . and that's going to be maybe a year from now . . . at best. It could drag out for five years, like "Incentive Licensing" did.

That's a pity because amateur radio is far more important to our country than I suspect the commissioners understand. I think it would be extremely helpful if half a dozen representative ham industry members could talk with the commissioners and explain what has happened in the past, what's happening now, and what all this means to the future of America. It wouldn't take very long . . . we could do it in one day . . . and we do have one heck of a story to tell.

We used to have an effective amateur radio National Industry Advisory Committee (NIAC), but the commissioners got so angry when their last no-code rulemaking proposal was trashed by the ARRL that the NIAC was killed in retribution. I made sure the FCC was again open to such an organization before I proposed it. I got an enthusiastic response from the Commission, but then was stiffed by the ham industry. That surprised and disappointed me, since the health of our hobby directly affects everyone's sales. It seemed to me to be a tad short-sighted. I got the feeling that I was one of the few in the business who really cared whether ham radio lived or died.

You see, I believe that the health of amateur radio has a direct bearing on America's technological future. As our country heads into the 2000s, where technology will be the determining factor separating the countries which are strong from those which are weak, I'm afraid we're going to be crippled without amateur radio providing the needed engineers, technicians and scientists.

My recent proposal that entrepreneurial hams consider desktop publishing brought in a huge stack of mail. Much of it said in effect, well you warned us when repeaters came along that there were business opportunities . . . and now look at cellular radio! Then you told us to get into computers . . . and you were right! Next you said to look out for compact discs . . . and that turned into the fastest growing consumer electronics industry in history. My record of calling the future isn't bad.

But apparently it wasn't nearly good enough to convince the ham industry. 95% of 'em thought I was full of baloney. There goes that gloom and doom Wayne Green again.

I predicted that Novice Enhancement wouldn't change anything. Hoo, was I right. I said the Archie comics were a huge waste of money. I said the ARRL videos promoting amateur radio were a waste of money. I really hate being right.

This spring would have been the ideal time for a NIAC group to meet the newly reformed Commission. The new commissioners are just getting settled into trying to cope with the demands for more frequencies and technology decisions which have far reaching implications.

They're trying to cope with the HDTV issue. The Information Age has brought with it the need to communicate all this information, and that means sorting out the roles for cable, fiber optics, microwaves, satellites and so on. Cellular radio has opened the door; now we're going to be faced with the spectrum needs for a pocket personal portable telephone system.

The job of a commissioner has never been great. Now, with communications demands multiplying a thousandfold, it's a killer. The public doesn't see any reason why they shouldn't all have direct satellite high definition TV on a hundred channels. They want a telephone, probably with fax, in their pocket, car and boat. They want an emergency location system for hikers. UPS and other fast delivery services want instant communications between their trucks and their computers, preferably with graphics capability. And all this has, somehow, to be crammed into the radio spectrum.

Did I mention community TV stations? The pressure is on for more AM and FM radio channels . . . probably to broadcast more Top-40 porno-rock garbage for teenie boppers.

The Long Range

A few years ago the FCC set up a Long Range Planning Committee (LRPC). Yes, I was a member. The purpose of the committee was to lay down some long range plans for coping with future emergency communications situations.

The committee discussed plans for coping with small local emergencies right on up to a full-scale nuclear attack. The committee was made up of top people in the government and communications industries. It was an impressive group.

The committee came to the conclusion that of all the communications services, only amateur radio would be able to cope with any serious emergencies. They found that the telephone service was the first to go. This was disturbing because so much of the present emergency contingent services have been designed to use the telephone. Most civil defense groups have gotten rid of their amateur radio helpers and are using the phone. Most emergency radio station coordination is by phone. What to do?

Then, as the committee looked into the ability of amateur radio to provide the communications which would be needed in any serious emergency, it was painfully obvious that a handful of old hams using Morse code (or even voice) would be completely useless. Only high speed digital systems could even hope to cope with the projected traffic volumes.

The slowness of packet radio acceptance and the refusal of most old-timers to even consider this high speed system meant that either something be done to attract youngsters to the service or it would be almost useless. This came down to the major stumbling block to getting newcomers licensed: the code.

This was why the FCC tried to get a no-code class license through. Then, when the ARRL got their member clubs to kill the proposal, the FCC Commissioners and staff were frustrated and angry. They disbanded the LRPC and amateur radio NIAC. Relations between the FCC and amateur radio, though seldom friendly, had never been worse.

With Bush's appointees replacing most of the old Reagan Commission, we finally had an opportunity to mend fences. We do have a lot of residual poison to overcome from the FCC staffers. These are the career FCC people who do the work and make the recommendations to the commissioners. These are the legal, technical and political people who, alas, have long memories for insults and slights from ARRL presidents and legal representatives.

The FCC "ex parte" rules make it illegal for anyone to sit down with the the commissioners and discuss anything to do with amateur radio. Obviously, any ham matters discussed would necessarily touch in some way on the current no-code rulemaking situation. The ex parte rule was set up to limit the influence of lobbyists on the FCC Commissioners and staff. Once something has been released for rulemaking it can no longer be discussed . . . unless the discussion is reduced to writing, and filed.

In this respect, the ARRL no-code petition, which triggered the rulemaking, could hardly have been submitted at a worse time.

With new commissioners coming on line, there was no practical way for them to deal with the ARRL petition except to just let their staffs go ahead and do it. Ultra bad timing for us.

Our 100,000 Techs

The recent FCC no-code rulemaking proposal threw an embarrassing light on the number of semi-hams we've allowed to stagnate: our Tech Class. The Tech ticket was supposed to be a halfway station toward General, not a backwater end in itself.

Thus a large licensee percentage is stuck up on our VHF bands, talking across town. Perhaps it's time to get 'em down onto our HF bands where they can enjoy DX pileups, jammed nets, DX lists, QRM, lengthy phone patches, band-jamming contests, plus an endless supply of brainless QSOs.

Dozens of ham clubs claim to have set up Novice classes, but if the graduating class pictures they've sent me so far are an indication, little has really happened yet. But now it's time to put this same boundless enthusiasm to work motivating Techs to get their General tickets. Hark, what is that sound I hear? Is it the groans from thousands of readers, oh lordy, Wayne wants us to DO something again!

The only difference between a Tech and a General ticket is the code. 13 per. So isn't it almost time to get some 13-per code practice going in your club? If you use the system I outlined a few months ago you should have 'em over the hump in a few days. No, practicing for a few minutes once a month isn't going to do diddley (or dottilly). You need to get 'em off dead center and practicing every night for maybe a crummy week.

Get 'em to get a practice tape and agree to stick at it every night for maybe 20 minutes. Please don't sabotage them with that miserable old ARRL code learning system which has already driven away hundreds of thousands . . . perhaps millions of potential hams in exhausted frustration.

You might cheer them on with stories of the wonders of working DX on the low bands. Tell 'em about the thrills of HF packet. It will be counterproductive to go into much detail about how pathetically little DX you can actually work in the 20m General band. Once they get there and find out, you can explain how simple the Advanced Class test really is.

So let's clean up our act. Let's give all those 2m repeater addicts a taste of real hamming. Tell 'em how eagerly the old timers on 3999 are waiting for them to check in. Ten is wide open to the whole world these days . . . calling them. All you have to do is overcome about twenty years of encrusted inertia.

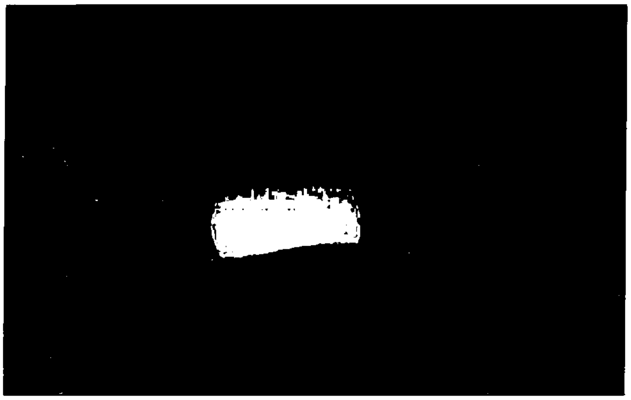
Constitution Prohibits Morse Code

Yes, I know, virtually all our courts except the Supreme Court are infamous for ignoring our constitutional rights, so bringing up a constitutional argument against the code is a complete waste of time. But the Constitution is quite clear in this matter.

The First Amendment says, "Congress shall make no law respecting an establishment of religion . . ." Well, Congress, through its sneaky agent, the FCC, has done just that and the religion they've established by law is the Morse Code. Morse Code is a belief system, with no more factual proof of its validity than any of the hundreds of other religions around the world.

As I have always said, I respect those hams who are true Morse believers . . . who believe that the Code is good for the soul and will keep out the heathen. I respect the high priests and the skills they have developed. I respect the enjoyment their religion brings them . . . the ecstasy. I'm just upset that this religion is a matter of United States law and a child of Congress, despite the First Amendment, which specifically prohibits such a congressional construction.

If I were mischief-oriented I would also point out that even the FCC regulations are clear in prohibiting our communicating in other than plain language. The Code is anything but plain language. Can we use plain Urdu language legally? It takes a lot of time and work to learn to communicate via the Morse Code, so it's anything but plain language here in America. There are more people in America who speak Chinese than know the Code. More who know Polish, Czech, Yiddish, and many other languages. Morse is an extreme minority language, yet it is mandated by Congress that we learn this rare dialect in order to be permitted to communicate with each other . . . even if we're not going to use it!



QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock, NH 03449. Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

When are we going to march angrily on Washington and fight for our beloved constitutional rights? Or are you going to sit there and wimp out, wringing your hands in embarrassment, hoping someone else will do what needs to be done? Where's your spunk?

What To Do? What To Do?

If you believe that amateur radio will best be served by stopping all further Novice or Technician licenses from being issued and changing instead to a Communicator License with a Tech level exam and no code test and with privileges only above 220 MHz, then write to the FCC, Washington DC 20554, commenting positively on RM9055.

If you believe, as thousands of hams do, that the code is so odious that only a federal law forcing people to use it will keep it alive, back up your convictions with a letter to the FCC. If you believe that preserving the code is far more important than preserving amateur radio, let the FCC know.

If on the other hand, heaven forbid, you aren't in complete agreement with the ARRL on this rulemaking, you'd better darned well write. On the other hand, isn't it better not to get involved and let someone else worry about all this?

No, I don't believe that anyone at the League was "bought off" on this one as a way to put a finishing blow on the hobby and thus free up hundreds of billions of dollars of microwave frequencies for commercial use. Yes, I know that there were some strong rumors that this has happened in the past. I read the Doyle (an incredibly indiscreet ARRL director) letters, too. But this "sale" of our ham frequencies was never actually proved.

You have until August 6th to speak (well, write) up.

There's one other thing you can do that would help. Since the ARRL is the only national organization we've got (they killed off the upstarts), all your money is riding on them. If you want the League to get busy selling amateur radio and would like to help stop them from sabotaging our hobby with nonsense like this Communicator Class license and their recent data communications petition, which I haven't even started to comment on as yet, you are going to have to become involved.

As long as you continue to blindly elect unqualified directors, you're going to get what you deserve. Elections come up every other year, so you could flush out the chaps who are killing our hobby in two years.

All most hams know about the League is what they read in *QST* . . . and not one in a hundred has even bothered to read the highly sanitized board meeting minutes. The League has its own Iran-Contra type scandals, you just don't know about them. Most hams don't *want* to know.

I've lifted one corner of the rock in the past, but the faithful start screaming that Wayne is bashing the League. Golly, isn't that what we heard when the Watergate scandal broke? Many Republicans didn't want to know. Anyone who complained was accused of administration bashing.

I'll tell you this . . . the editors of the ham magazines know, but seem terrified to say anything. Bill Orr, Stu Cowan and Pete Hoover know. They're the ones who recently demanded that ARRL President Price not be re-elected. But unless you know a director personally and he levels with you, *you* don't know. And, sadly, the odds are enormous that you don't want to be bothered.

I've had a great time with amateur radio during the last 50 years and I'll really hate seeing it go down the toilet. I try to get you to share in the good times I've had . . . and to help cure the bad aspects. 73

ATV

Ham Television

Bill Brown WB8ELK
%73 Magazine
Forest Road
Hancock NH 03449

TV Cameras

Finding an inexpensive video camera can be a real challenge these days. It seems that all that you can find at the local video store is a wide array of camcorders. Separate cameras have become a thing of the past. However, there are several sources to consider.

Look around at your local hamfest for any type of security cameras or the older stand-alone types. These can occasionally be obtained for a real bargain price, although you may find some burn spots in the image from the older security cameras.

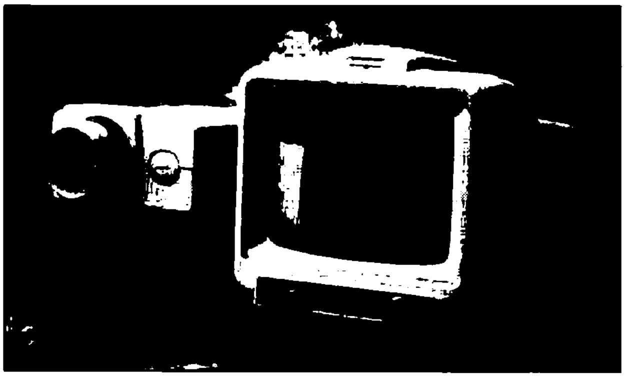


Photo A. Uniden "House Detective."

Fortunately, there are still a few commercial sources of stand-alone video cameras. One inexpensive choice is the Uniden security camera. This is a low resolution B/W camera requiring outdoor lighting. However, it is a CCD camera with an electronic auto-iris, and a good candidate for R/C aircraft, tower-mounted cameras and site security due to its small size and current drain. The Uniden camera is available from P.C. Electronics as well as DAK Corp under the name of "House Detective."

The Fordham catalog has a couple of pages of suitable cameras for ATV use. Although more expensive than the Uniden, these provide an excellent quality image at a fairly reasonable cost. One particularly good choice is the Sony HVM-322-BNC, a very lightweight, 6-ounce B/W camera which includes a motor-driven auto-iris. This camera has been used quite successfully in many balloon flights up to over 100,000 feet, and it has survived high speed impacts, −60 degree temperatures and occasional pointing at the sun. It's an excellent choice for R/C modelers and it can take a lot of high-G punishment. It comes with a built-in wide-angle lens and works quite well in light levels as low as 5 lux. Also carried in the Fordham catalog is the Sony model CCD-G1S color CCD camera which looks like a real winner, but be prepared to pay for the color!

CCTV Corporation is another good source for closed circuit cameras. The GBC model CCD-500 is a compact B/W camera with a C-mount lens (optional). The C-mount allows you to use a variety of lenses, including one with an auto-iris. The CCD-500 is perfect for astonomers due to its rated 0.02 lux sensitivity and excellent resolution. For this camera, the light from one match is enough to illuminate a room. Hooking a CCD-500 up to a 10-inch telescope allows you to distinguish stars down to about 9.5 magnitude.

The GBC model CCD-100 is one of CCTV's latest offerings. This ultra-compact B/W camera is a little smaller than a pack of cigarettes. They even offer fake cigarette packs in which you can conceal your camera, as well as a number of other "covert enclosures." The CCD-100 comes with a built-in 4mm lens which provides an ultra-wide 78-degree field of view. It weighs 3.5 ounces, and is usable down to 2 lux illumination. One of the unique features of this camera is its electronic shutter. The camera automatically adjusts to a wide range of lighting conditions by varying the electronic shutter from 1/60 to 1/15000 of a second. Due to its small size and low current drain, this ought to be another excellent candidate for R/C airplanes and mobile operations. It can serve as one of the building blocks for an extremely portable ATV station. Combine this with one of the small LCD TV sets and an ATV transmitter, and you have the makings of a "Handie-Lookie"!

Photo B. The Sony HVM-322-BNC (left) and CCD-G1S (right).

Both of these cameras are available at dealer cost to *73* readers if you mention this column to Gary Perlin at CCTV. The CCD-500 is available for $469.50 and the CCD-100 for $325.

Compact color cameras are usually fairly pricey. One of the better deals is the Sanyo VDC-3900. This camera weighs 14 ounces, and is in the $600 price range.

Photo C. GBC CCD-100.

The CANON CI-10 and CI-20 are self-contained miniature marvels. These high resolution color cameras are often used for network racing and sporting events. They have been attached to skiers, race car drivers and skydivers! The CI-10 measures just 2-1/2"W x 1-7/16"D x 4"H. The CI-20 is a compact 2-3/16"W x 2-5/16"D x 3-9/16"H. Both have a C-mount to allow for different lens configurations. Expect to pay for this miniaturization, as the CI-10 is priced at $1000 and the CI-20 at $1995.

Two other cameras in the CI-20 line may be of interest. The CI-20M is a high resolution B/W camera, and the CI-20R with its attached infrared light source will allow you to literally "see in the dark."

Philips Components has some inter-

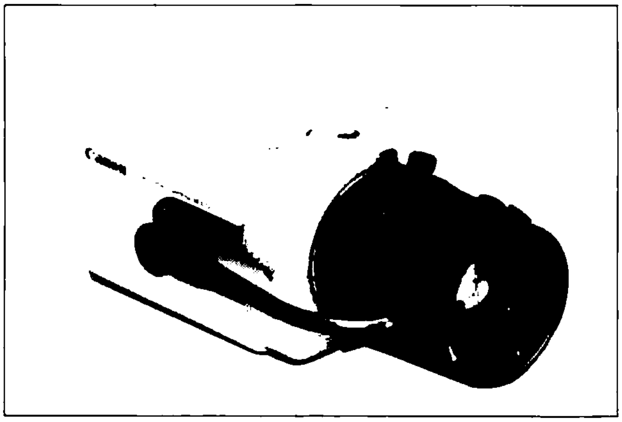


Photo D. Canon Ci-20.

TV Camera Sources

CCTV Corp. (GBC)
315 Hudson St.
New York, NY 10013
Ph: 1-800-221-2240

CANON U.S.A., Inc.
One Canon Place
Lake Success NY 11042
Ph: 1-516-488-6700

DAK Industries, INC.
8200 Remmet Ave.
Canoga Park CA 91304
Ph: 1-800-325-0800

EEV, Inc.
4 Westchester Plaza
Elmsford NY 10523
Ph: 1-800-342-5338

FORDHAM RADIO
260 Motor Parkway
Hauppauge NY 11788-5134
Ph: 1-800-645-9518
1-800-832-1446 NY

P.C. Electronics
2522 Paxson Ln.
Arcadia CA 91007-8537
Ph: 1-818-447-4565

Philips Components
P.O. Box 278
100 Providence Pike
Slatersville RI 02876
Ph: 1-401-762-3800

SANYO-FISHER Service
Industrial Video
1200 W. Artesia Blvd.
Compton CA 90220
Ph: 1-213-605-6527

SONY Security Systems
15 Essex Road
Paramus NJ 07652
Ph: 1-201-368-5018

Photo E. Rose Parade (photo courtesy of ATVQ).

know so I can pass along the information via this column!

Parades

A parade or special event is a golden opportunity to demonstrate the public service aspects of ATV. Parades, walkathons, bicycle tours, etc. all require some form of coordination and emergency services. If enough portable or mobile ATV stations can be put together in your area, you can offer your services to help out with any special event.

The annual Pasadena Rose Parade is one prime example of the effectiveness of ATV in public service. During the 1989 Rose Parade, the ATN group (Amateur Television Network) mounted a massive effort. There were 13 camera positions scattered along the parade route, 2 motorcycle mobile stations, and even a helicopter mobile. These were all linked on 434 MHz to a portable repeater on a tall building which relayed each remote camera to the parade command center via the 1200 MHz band. In addition there was a 10 GHz link to the emergency services command center. Those of you with TVRO satellite dish systems were in for a special treat that year, as they even uplinked all ATV activities on a geostationary satellite so that hams in North America could join in the fun.

Photo G. Ernie WB6BAP with his portable ATV repeater (Rose Parade).

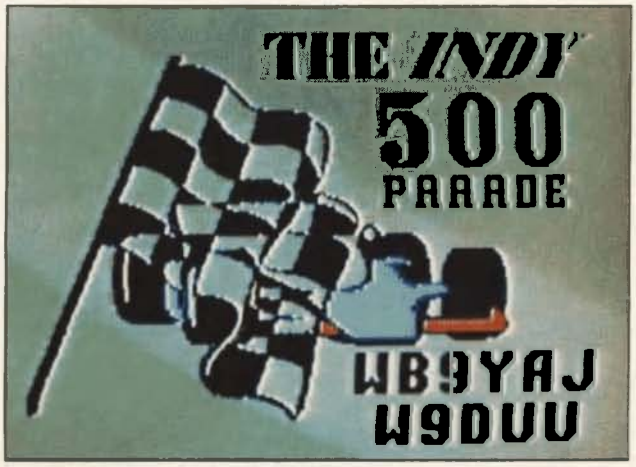


Photo F. INDY 500 Parade

esting color camera modules available. Their model #56570 (PAL version) and #56571 (NTSC) are extremely small, with C-mount adaptors. These are high resolution and low-light level units (0.2 lux). The B/W versions are models #56470 and #56471. You'll have to provide your own case, but this allows you to build the camera into your own customized configuration. The single quantity price of the color module is $875, but this comes down to $700 if you order 10 or more.

EEV, Inc., has a modular camera with some interesting options, particularly for astronomy or night surveillance work. Although the camera plus options are expensive for average ATVers, their catalog is fun to browse through.

If you have any additional information on a good source of inexpensive B/W or color cameras, please let me know so I can pass along the information via this column!

This May 27 the Indianapolis ATV group plans to cover the annual INDY 500 Parade. Seven camera positions will be perched atop several skyscrapers overlooking the parade route. By means of a 2-meter coordination net, each camera position can be told to transmit and zoom in on any problem that may occur. The camera site sends the signal on 439.25 MHz (LSB) to a portable ATV repeater on top of the Landmark Center building in downtown Indianapolis, which relays the picture to the parade command center via 910.25 MHz. In addition, there will be a microwave link to the Channel 8 transmitter site which can relay all of the activities to the K9LPW ATV repeater.

Activities

I'd love to see activity reports from across the country and the world. Please send me photos and a description of ATV operations in your area for possible use in the ATV column. Also please send any interesting circuit and antenna designs we can share with our fellow ATVers.

Remember to look for the weekly Tuesday night ATV net on 3.871 MHz at 8 pm EDT.

Be A Ham?

The invisible fraternity.

by James L. Paul N6SIW

As an adolescent, I first became interested in amateur radio after working at a television station in central California. The station engineers were hams and always seemed to be able to communicate with each other, while the regular commercial radio system failed for the rest of us. My knowledge of repeaters was limited to the proper button to press when using the radio in my station vehicle. Even then, I didn't realize the station engineers were hams, and I knew nothing about amateur radio.

After returning to school, I realized that I had taken at least an introductory class in nearly every subject offered at four different colleges, but I had never been exposed to ham radio. Even two years of telecommunication courses in broadcast radio and television hadn't included any mention of ham radio. After leaving the job with the television station and moving to another city, I decided to learn something about ham radio.

Where to Go?

First, I went to a large bookstore. I was shocked to find a total absence of books about ham radio! Next, I visited Radio Shack. Another total absence of ham information. (Radio Shack has since improved somewhat.) On to the public library! By this time, I was beginning to feel as if some sort of conspiracy was going on. I was on the verge of obsession, and called every bookstore in the phone book. I finally found one that carried a couple of ham magazines. After 95 miles round trip, I finally had two ham magazines! Feeling victorious, I opened the pages to read about—you guessed it!—the dwindling ham population!

This stunned me somewhat. Hams worried that not enough people were taking up the hobby? Hams were trying to attract interest and young people? Wow. This was so contrary to my experience that I found it hard to believe at first. I had cultivated the impression that amateur radio was an elite club for members only, and that newcomers were not solicited.

I read through the magazines to find information on how to become a ham. Amazingly, I found nothing. Not one clue for joining this hobby that claimed to be screaming for new people. All the stuff in the magazines was aimed at people who were already in the ham fraternity. I decided to find and talk to a member of the fraternity.

Looking for an Elmer

Soon I was parked outside a house that had a big antenna tower in the yard. Next, I was knocking on the door. This led to attending a meeting of the local ham club. People at the club meetings were polite, but I still felt very much like an outsider. I did get information on licenses, though. I downloaded a Morse code program for my computer, and started practicing.

About this time, I moved again. After settling in, I tried to find out about local ham activities. Nothing in the phone book. Nothing in the local stores. Nothing in the local paper. Sigh. I called the local paper, and asked them to research anything they could find. They had to go back more than 20 years, but they found an article mentioning amateur radio. I called the person named in the article, a past president of the local ham club, and he was able to put me in contact with a current member. Eventually, I was licensed at a hamfest sponsored by that club.

Not on the Menu

So what's my point? It's that I had to actively hunt for amateur radio. Ham radio certainly didn't come looking for me. I think the attitude of hams toward their hobby is significantly different from the viewpoint of non-hams. Many people see ham radio as a "good old boy" fraternity, if they see it at all. Hams speak in tongues and use code, and talk only to each other. Most people have no idea what ham radio really is.

In this age of audio-video bombardment, choices for hobby and sport interests are endless. People choose their interests from the menu that's placed before them, and amateur radio rarely appears on that menu. With all the tempting choices on the menu, why bother to pursue choices that don't appear? To people looking in, amateur radio seems to want to keep people out. Otherwise it would be on the menu, right?

If ham radio were open to all, it would be in the phone book. If club meetings were open to all, they would be in the newspaper. In today's society, if it's not in the phone book, on TV, or in the paper, it doesn't exist. If it's not easy to find, it doesn't want to be found. If it's hard to find out about ham radio when a person *is* trying, it must be hopeless when a person *isn't* trying. Unless people are actively seeking to become hams, they will never think of amateur radio as a hobby.

When was the last time you saw a billboard with a flashy ad and standing invitation from the local club? How many ham clubs are in the local Yellow Pages? And how many schools include amateur radio as part of the curriculum? Even the time and place of most exam sessions are known only to hams. The average American kid never hears about ham radio in school. Without ham radio in their peer group, it doesn't exist as an activity to a kid.

Yes, I know there are exceptions to all this. There always are, usually due to exceptional people.

What the Hobby Needs

Amateur radio has an image problem. I don't know whose fault it is, but it's there. This hobby needs to be marketed. It needs to be packaged and sold. Among the "products on the shelf" competing for a person's time and interest, amateur radio is rarely on the shelf. When it is on the shelf, it's a dusty, unrecognized product with no brand name. We need to slap on a bright new label, and compete in the market for the time and interest of potential ham operators.

How about a short column in the local paper to inform the community of ham activities? Or a small ad in the yellow pages under "clubs"? Such an ad would make ham radio seem more normal, and increase credibility in many people's eyes.

One of the most common ways for a person to take an interest in a hobby is by learning it from someone they know. I had ham friends, however, that I knew for years, and they never told me they were hams until I became a ham myself. This attitude has probably contributed to the problem more than anything else. It suggests that amateur radio is an elite, private club.

Without demand, ham products and magazines will not grace the shelves of many stores much longer. Without products on the shelves, demand is harder to create.

I had to seek amateur radio, even before I knew exactly what it was. I had to go out of my way and overcome several obstacles. Why should people bother, when there are plenty of other things to do?

In short, hams can't wait for people to come to them. Hams must take amateur radio to the people, and make them aware that amateur radio is a superb way for young people to become interested in, and develop expertise in, electronics and radio communications. Though no longer at the vanguard, amateur radio still contributes to technological development. Fewer hams may homebrew their own stations, but they're always coming up with ways to improve existing systems. They are especially good at doing it *cheaply*.

Fellow fraternity members, we must pummel them about the head and shoulders with our hobby. How else will they know we're here? 73

At 25 years of age, James L. Paul N6SIW has been writing computer software commercially for nine years—since he was sixteen. He learned a lot from his parents; both of his parents teach computer science, and his father also teaches physics and chemistry. You may contact him at 4920 N. Backer #221, Fresno CA 93726 or on Compuserve 72767,3436 or GEnie "J PAUL."

Dx

Number 40 on your Feedback card

Hams Around the World

Bob Winn W5KNE
℅QRZ DX
PO Box 832205
Richardson TX 75083

Where is That Soviet Station?

Possibly one of the most often-asked questions by both neophyte DXers and old-timers is, "How do I determine the DXCC country of a Soviet station?" A typical response would be something like, "Look at the callsign prefix." The structure of the Soviet callsign system appears to be complex and undecipherable, so the above question is not unreasonable, but the typical response is only partially correct.

In most cases, especially for a typical callsign with a prefix beginning with R or U (UA1AAA, RB5XX, UC2AWA, etc.), it is fairly easy to determine a station's DXCC country if you know the rules. Special event callsigns made of unusual letter combinations (UØY, UX4L, RXØC, etc.) or beginning with letters other than R or U (EN3D, ER3W, EOØAAK, etc.) are often difficult to decipher. We'll discuss the latter soon. This month, we'll look at the Soviet callsign system, including what constitutes a typical callsign and a few rules about callsigns in general.

The current method of callsign assignment is very systematic, and after learning just a few simple rules you will be able determine the DXCC country of more than 90% of Soviet stations that you might encounter. Most callsigns issued during the past 20 years have a built-in logic that often identifies the station's location. This includes callsigns issued for club stations, special event stations (1X1, 2X1, special prefixes, etc.), and all typical callsigns beginning with the letters R and U.

A Few Simple Rules

The Soviet callsign system is based on oblasts or regions. Generally, each region is identifed by one or more unique prefix/suffix combinations. Once you are sure that the station is Soviet, you can usually determine its location easily. The Soviet Union is authorized to use callsigns taken from the following ITU-assigned callsign blocks: **EKA-EKZ, EMA-EOZ, ERA-ESZ, EUA-EWZ, EXA-EZZ, LYA-LYZ, RAA-RZZ, UAA-UZZ,** and **4JA-4KZ.**

A typical amateur radio callsign consists of a two-letter and single-digit prefix followed by a two- or three-letter suffix, such as RAØUI, UM8NA, UM9MNY, UZ4FWD, etc. Callsigns beginning with **RZ** and **UZ** (with a three-letter suffix) are reserved for club stations in the Russian Republic. Outside of the Russian Republic, a club station is identified by the second letter of the suffix. If the second letter is **W, X, Y** or **Z**, then the callsign is assigned to a club station, for example, UA9AZD, UA2FWA, etc.

To determine the DXCC country of a typical callsign, refer to the table. Take UM9MYY, for example. Ignore the first letter of the prefix (U). Locate the second letter, **M** in the table, then check the digit column (in this example the digit is meaningless) and read across to the right to determine the DXCC country. Now determine the DXCC country of UZ4FWD. If you got European Russia, you used the table correctly.

The Soviet callsign structure is complex, but with a few easily-learned keys, you can unravel the secret of the majority of Soviet callsigns. Most countries have based their amateur radio callsign prefixes on geographical or political divisions such as province, state, region, etc., and they use a digit in the callsign prefix to identify where the station is located within the country. In the Soviet Union this is true only in certain areas. The Soviet system has added an additional bit of information that identifies the station's oblast. Before I give you the secret keys, you must first learn some basic facts about the Soviet Union. Not too much, but just enough to help you understand the Soviet callsign system.

The Soviet Union in Particular

The Union of Soviet Socialist Republics (U.S.S.R.), also known as the Soviet Union, is divided into 15 Soviet Socialist Republics (S.S.R.) which are supposedly based on the fifteen most populous and advanced nationality groups in the country. However, not all major nationality groups are represented as union republics because of the way the Soviet constitution is worded, but that's another story. The structure is quite complicated with the country being further divided into various political administrative units such as the S.S.R., autonomous S.S.R. (A.S.S.R.), kray, oblast, autonomous oblast, and others. The oblast and the kray are at the same general level as the A.S.S.R. The other administrative units are of little use to us in the DX game.

The oblast is a unit created purely for administrative convenience, but it holds some significance for amateur radio operators because the Soviets offer an award for confirmed contacts with oblasts. But more importantly, the location (oblast) of most Soviet stations can be determined from the first letter of the callsign suffix.

Most Soviet callsigns assigned during the past 20 years have been issued systematically with the oblast as the key element. This key element—the oblast—is coded into the suffix of all typical callsigns and most special event callsigns. This month we'll concentrate on typical callsigns—those that begin with the letters U and R and that have the familiar 2x2 or 2x3 format, such as UA1AAA, UB5QR, RV6IAA, etc. We'll tackle special event callsigns next month.

The first letter of the callsign's suffix identifies the station's oblast (geographical area or republic). This means, for example, that all stations operating from the Asiatic Russian Republic that have the letter **Y** following the digit in their callsigns (UAØYB, RVØYA, UZØYWA, etc.) are ALL located in oblast 159, the Tuva Oblast. The notation "UAØY" can then be used to identify this oblast, and a Soviet station operating portable might sign /UAØY, /RAØY or even UØY, which is a legitimate callsign.

This rule provides a method of identifying the oblast, but not the oblast's name or number. This information is obtained from an oblast list or by looking up a similar callsign in the Soviet Union section of the *Radio Amateur Callbook*. If you are serious about unraveling Soviet callsigns, I suggest that you purchase the 15-page *DXNS USSR Oblast Guide* from Geoff Watts, 62 Belmore Road, Norwich NR7 OPU, England. The cost (air-mailed to purchasers outside of England) is $4 or 8 IRCs.

Next month we'll discuss Soviet special event and contest callsigns, and if room permits, unique callsigns/prefixes of other countries. ■

R and U Prefixes
for determining the DXCC country

First Letter	Second Letter	Digit	DXCC Country
R, U	A, V, W, Z	1, 3-6	European Russia
R, U	A, V, W, Z	Ø, 9	Asiatic Russia
R, U	A, V, W, Z	2	Kaliningrad
R, U	B, T, Y	Any	Ukraine
R, U	C	Any	Byelorussia
R, U	D	Any	Azerbaijan
R, U	F	Any	Georgia
R, U	G	Any	Armenia
R, U	H	Any	Turkmenistan
R, U	I	Any	Uzbekistan
R, U	J	Any	Tadzhikistan
R, U	L	Any	Kazakhstan
R, U	M	Any	Kirghizia
R, U	N	1	European Russia
R, U	O	Any	Moldavia
R, U	P	Any	Lithuania (now LY)
R, U	Q	Any	Latvia (now YL)
R, U	R	Any	Estonia (now ES)

Number 41 on your Feedback card

. . . de K6MH

New Talent at *73*

I'm delighted to call your attention to two new people on the *73* editorial staff: Bill Brown WB8ELK, and Mike Nugent WB8GLQ.

Besides being congenial, Bill is a technical whiz. He likes to launch amateur TVs via balloon, kite or rocket and has done so in various places around the world. Our ATV editor for several months, Bill has now joined us here in New Hampshire full time. Besides being deeply into fast-scan TV, Bill has our Amiga working on various SSTV modes, and just got a hi-res weather fax receiver going. Beautiful! Bill's fascination with amateur radio dates back to the earliest days of *73*. He stays right on the leading edge of the hobby, and has gained a lot of respect from those that have worked with him or heard him talk.

Mike Nugent, "Nuge," has been on the scene for a few months. He is the editor of a fine little magazine, *Portable 100*, for RS laptop buffs. Nuge spends half days here with us, delving into packet, and editing. Nuge is a much-sought-after computer wizard, programmer, and problem solver.

You'll be seeing the impact of these new talents in the magazine right away. We're proud to have them aboard. I think you will be, too.

I've been holding forth in this spot for six months. Let's take a look at some feedback:

06 April 1990

73 Magazine; *"K6MH"*
Editorial Offices, WGE Center
Hancock, N.H. 03449

Dear K6MH & Editor of 73,

Your editorial suggestions (p.88 March '90) may be well taken in some cases but the bottom line is that "Ham Radio" is a hobby and therefore means different things to different people. As a hobby, each person is entitled to do his own thing even if it means talking about the new equipment that he just purchased for an arm and a leg. I have since listened across many bands and indeed find all types of subjects being discussed. Most with genuine concern, interest and even humor!

Ham radio has many constraints too. Especially in talking with other countries where the legal rules say ". . . that the subject matter is of such inconsequential interest that commercial facilities would not be used. . ." Further, ham radio is not college or even kindergarten for that matter (?14313 excepted?) and many people have already used their grey matter to stimulate their business interests and just want to "shift gears" for a few minutes or hours of relaxed rag-chewing about any subjects or fluff they want without feeling guilty about it!

I listen on the HF bands more than I talk and I have heard a great many interesting, QSOs. Many more were routine, some were most educational, even brilliant, along with the deteriorating, argumentative, destructive, inane and ignorant—vulgarity that advertises the inferior mental level behind the voice-box of its owner. However in our case this is a hobby being exercised in a free country, by free individuals of wide, if not extreme, diversity but with a common interest in THIS hobby, its equipments, modes, antennae, problems, joys and the so-called cocktail conversations about and between fellow hams. Such discussions shouldn't seem unnatural or undesirable. In fact some people are indeed turned off by discussing politics (Town Meetings), special interest groups, etc. Often the mere mention of Congress, IRS, Supreme Court Decisions, the recent 14313 Mhz self-righteousness, etc., can run a number of people to the boob-tube or the heart specialist instead of our wonderful hobby!

Most of us that could pass the FCC test (up to now) must have enough spunk, success, pride or ambition to decide what "WE" want to talk about and many switch from signal reports to the more interesting but enjoyable topics of "THEIR CHOICE" even if others would not feel inclined to join the OSO. Look at the "ARRL NET DIRECTORY" and see some open, special interest nets for Novices, religions, weathernets, OCWA, traffic, Round Tables, ARES, R-Vers, Computer Interfacing, Practice, Breakfast Club YL, training, Breezeshooters, AMSAT, "Grandfathers" and the ham groups of former military people and even our Possum Hunters Net! Some would also prefer their own private OSO anyway.

Some may need a prod but for most of us it's "enjoy" or OSY. But PLEASE let's always—"Live & Let Live." OK?

73,
Frank E. Brooks II, W4UMC

Right on with Live and Let Live! I'm wholeheartedly in favor of anything that is alive, exciting, and fun in ham radio. Speaking of which, did you see Bill Brown's suggestion in last month's ATV column for enticing computer addicts into amateur radio, by sharing games and programming directly via ATV?

I'm not crazy about having books recommended to me. But here are two I am so impressed by I feel duty-bound to pass the word along: *Diet for a New America*, by John Robbins (Stillpoint Pub.). An in-depth tour of our food sources, and one of the best books on this planet's ecosystem I have seen. The second is *The Continuum Concept*, by Jean Liedloff, subtitled: Allowing Human Nature to Work Successfully (Addison-Wesley Pub.). John Holt, who has a lot of my respect, said, "If the world could be saved by a book, this just might be the book." Sounds pretty strong. I agree. 73

Number 42 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
PO Box 1079
Payson AZ 85541

In general, HF DX during June is in the proverbial doldrums, although with the sunspot numbers nearly at peak, and solar flux high, you may expect June to be a decent, if not spectacular month. However, for you VHFers, June ought to be extremely good, with the MUFs so high.

On a daily basis, the first seven or eight days of the month ought to provide good HF conditions with the bands open well after dark on almost all of the HF bands. June 22 is the longest day of the year in the Northern Hemisphere and dark doesn't usually come until after 9 p.m. local time. . .so you can have a good day of DXing even after working hours! Conditions for the week between the 13th and 20th may be very poor for HF band contacts, with possible solar flares and high magnetic field indexes. Conditions should improve to fair and remain anywhere between fair-to-good and fair-to-poor for the rest of the month.

As always, be sure to keep a daily check on WWV at 18 minutes past the hour to watch for trends in propagation conditions. Remember that a high solar flux and a low A index for the Earth's magnetic field are the good signs to look for. Short skip and sporadic E propagation are likely to abound, and almost daily coast-to-coast propagation will be the rule on bands as high as 10 meters, and maybe even 6 meters on the good days. With Cycle 22 now exhibiting its peak, DX will be better than ever, even in an "off" month like June. For indications of band conditions on any given day, also listen for the DX beacons on the upper HF bands. They will be operating from 10 meters through 20 meters, and if you hear them coming in strong you can bet the band will be excellent. Even if you don't hear signals call "CQ"—you could be pleasantly surprised! 73

EASTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	—	20	20	—	—	20	20	—	—	—	—	20
ARGENTINA	15	20	20	—	—	—	—	—	—	10	10	15
AUSTRALIA	15	20	20	20	—	40	20	—	—	—	—	10
CANAL ZONE	15	20/40	20/40	20/40	—	20	10	10	10	10	10	15
ENGLAND	40	40	40	—	—	—	15	[illegible]	10	[illegible]	[illegible]	20
HAWAII	15	15	20	20	40	—	20	—	[illegible]	[illegible]	10	[illegible]
INDIA	20	—	—	—	—	—	15	15	—	—	—	—
JAPAN	—	20	20	—	—	20	20	—	—	—	—	20
MEXICO	15	20/40	20/40	20/40	—	20	10	10	10	10	10	15
PHILIPPINES	—	—	20(1)	—	—	20	15(1)	10(1)	—	—	—	15(1)
PUERTO RICO	15	20/40	20/40	20/40	—	20	10	10	10	10	10	15
SOUTH AFRICA	20	—	20	20	—	—	—	—	10	10	15	15
U.S.S.R.	—	—	20	20	20	—	—	15	15	—	20	20
WEST COAST	20	20/40	20/40	40	40	40	10	10	10	10	10	15

CENTRAL UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10(1)	20	20	20	—	—	20	—	—	—	15	[illegible]
ARGENTINA	15	15	20	20	—	—	—	10	—	10	10	10
AUSTRALIA	10	15	20	20	20	[illegible]	20	20	—	15	10	10
CANAL ZONE	15	[illegible]	[illegible]	[illegible]	—	—	10	10	10	10	10	10
ENGLAND	—	—	—	—	—	—	—	15	[illegible]	15	20	20
HAWAII	[illegible]	15	20	[illegible]	[illegible]	[illegible]	20	—	—	10	10	10
INDIA	15	20	—	—	—	—	20	15	—	—	—	—
JAPAN	[illegible]	20	20	20	—	—	20	—	—	—	15	[illegible]
MEXICO	15	[illegible]	[illegible]	[illegible]	—	—	10	10	10	10	10	10
PHILIPPINES	[illegible]	—	20	—	—	—	20	15	15	—	—	[illegible]
PUERTO RICO	15	[illegible]	[illegible]	[illegible]	—	—	10	10	10	10	10	10
SOUTH AFRICA	—	—	20	—	—	—	—	—	10	10	15	20
U.S.S.R.	—	—	20	—	—	—	—	15	15	20	20	20

WESTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	[illegible]	—	20	20	20	20(1)	20	—	—	—	[illegible]
ARGENTINA	10	15	20	20	20	—	—	—	10	—	10	[illegible]
AUSTRALIA	10	10	15	20	20	[illegible]	40	20	20	—	10	10
CANAL ZONE	15	15	[illegible]	[illegible]	20	—	—	[illegible]	10	10	10	10
ENGLAND	—	—	—	—	—	—	—	—	15	15	20	20
HAWAII	10	15	15	20	[illegible]	40	40	—	15	15	—	10
INDIA	15	15	20	—	—	—	—	20	15	—	—	—
JAPAN	10	—	—	20	20	20	15	20	—	—	—	[illegible]
MEXICO	15	15	[illegible]	[illegible]	20	—	—	[illegible]	10	10	10	10
PHILIPPINES	15	—	—	20	20	20	20	20	20	20	20	15
PUERTO RICO	15	15	[illegible]	[illegible]	20	—	—	[illegible]	10	10	10	10
SOUTH AFRICA	20	20	20	20	—	—	—	—	10	10	15	20
U.S.S.R.	—	—	—	20	20	—	—	20	15	15	20	20
EAST COAST	20	[illegible]	[illegible]	40	40	40	10	10	10	10	10	15

Note (1): Possible on some days.
Use 10 for 10 & 12 meter bands, use 15 for 15 & 17 meter bands, use 40 for 30 & 40 meter bands. Where 2 bands are shown try both. This data is for the highest possible frequency to be used of a given path (MUF).

JUNE 1990

SUN	MON	TUE	WED	THU	FRI	SAT
					1 G	2 F
3 G	4 G	5 G	6 G	7 G	8 G	9 G
10 G	11 G-F	12 F-P	13 P	14 P	15 P	16 P
17 P	18 P	19 P	20 P-F	21 F	22 F-G	23 G-F
24 F	25 F	26 F	27 F-G	28 F	29 F-P	30 P

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LETTERS

Number 1 on your Feedback card

From the Hamshack

KA1COJ: I haven't been very active lately—maybe 20 QSOs a year. I picked up your March *73* and read it through. Your column stuck in my mind, so I read it again a couple of times. Suddenly it all made sense to me. I ordered your 20 wpm Blitz Tape and the Tech, General and Advanced books from "Uncle Wayne's Book Shelf." The night the package arrived I plugged in your tape and followed your instructions. I spent about ten minutes a night with the tape. By the first week I'd gone from around 7 wpm to being able to copy W1AW almost solid at 13 per. By the second week I could copy the ARRL CW bulletin! Just 17 days after getting your tape I passed the 13 per General test with flying colors. It was the greatest feeling walking out of the exam with my temporary certificate. I'm a believer again! Thanks, Wayne.

Good work Arthur, now get all the rest of the Novices and Techs in your area going Wayne

Griggs, Milford DE: I've read your recent ideas for attracting new hams and would like to add more fuel. The local ham clubs don't list their activities in the newspapers, nor in the telephone books. Through the help of WA3DPJ and his partner at A & A Electronics I was able to take my Novice test and pass. It would sure help if clubs would list activities in the newspapers and on school, ham store and Radio Shack bulletin boards. How about clubs renting out the extra ham gear which the members have available? If we paid for our licenses maybe the FCC wouldn't make us wait for six weeks for our licenses.

NH6EN: I share your fear that we will become a second rate nation in education and technology. We need to expose our kids to science, math and technology in a positive way. The Hamsats in the classrooms is an excellent idea. I'm involved with the Naval Sea Cadets (submarines), a new program I started. The kids love it. I'm getting ready to put on an amateur radio demonstration in the local school. I know it'll be a big hit. These kids really eat this stuff up! I find it very rewarding.

Good show Robert, but don't forget to take some pictures for me . . . Wayne

Guy Lemke, Redding CA: I don't see any effort around here by hams to attract newcomers. I know many people who would love to have a ham ticket but don't know where to start or where to get the support it takes to keep them motivated. It's a shame.

Okay, Redding hams, where are your club meeting notices in the papers? Where's your notice on the Radio Shack bulletin board? Wayne

W2JTP/7: Ever since reading the March and April issues of *73* I have been trying to talk on the air about the FCC letter to the nine nets and bulletin broadcast operations about the net mess on 14,313. I've also asked about the request for the ARRL president to decline his nominations for another term. While several of those contacted had read the limp-wristed condemnation of the Bouvet Island DXpedition QRM in *QST*, it was noted that no calls were listed as QRMers! On 2m I contacted 12 local stations. Five had heard about the 20m QRM mess and the FCC letter. Only two (*73* readers) had heard about the ARRL president. One Extra Class got nasty. "If it isn't in *QST* it isn't true." One advantage of being out here in Seattle is that I don't hear the K1MAN broadcasts.

Yes Byron, I know about the poor, brainwashed ARRL members who are completely unable to think for themselves. Sometimes I look at my 50-year pin and shake my head Wayne

Dorian Blasdell, Grants Pass OR: I'm 17 and working on my Tech license. I've tried to get several of my friends interested, but they can't seem to believe that the code isn't as hard as they think it is. I don't know if there's a local ham club or not. None is listed in the phone book and I've seen no mention of meetings or classes in the paper. Keep publishing articles on ATV, SSTV, VHF, UHF, digital and satellite communications.

Barbara Friend, Warren NJ: I'm not a ham myself. I'm a foreign language H.S. teacher and was shown your May issue by a friend. I am impressed by the education articles about Mary Duffield and Carole Perry. I've gotten some good ideas from what I read. I think that Carole Perry's approach is applicable to what I'm doing and I intend to contact her. I thought you'd like to know that some of your otherwise technical articles made an impact on a non-technical reader.

Diane Prucher, Los Angeles CA: As a third grade teacher trying to get started in ham radio and to bring along children from kindergarten to eighth grade, I appreciated very much the May, 1990, issue of *73*. It was just about the only item I could find in West Los Angeles to get started with. Mr. Green's upbeat and aggressive editorial gave me personal hope that in time children will be able to access the wonderful world of electronics through radio. They have the ability but society has more pressing priorities than its children at this time.

N4XAN: In just about every shortwave/ham magazine there is usually a listing of the frequencies that will be used by WA3NAN, W5RRR and W6VIO for retransmission of space shuttle audio. WA3NAN at the Goddard Space Center, Greenbelt, MD, broadcasts on a 24-hour basis. I would ask that all amateurs assume that the frequency is in use. In a time when we are looking for ways to attract the younger set to ham radio, having a service such as is provided by these three clubs can be a real Godsend. Let's all try to give these frequencies plenty of "elbow room" (1 kHz just isn't enough). Often, new hams and SW listeners (potential hams) don't have sophisticated equipment to IF shift, vary bandwidth and notch out somebody who wants to talk about the weather and his rig. If we all can pay a little attention, space shuttle missions can be a fun time for all. I know two little boys who really like to come into my shack to listen! By the way, thanks to all who did leave the frequency courteously after being told it was in use. Thank you & 73s to all!

WA2ANG: I enjoy reading *73 Amateur Radio* and frankly one of the reasons I buy it is because of your editorials. I find you are right on the mark most of the time. You are a mover and a shaker and ham radio as well as our society needs conceptualizers and movers. We've become a lazy lot. I would like to see more advanced technical articles and was quite surprised to hear that this would be overwhelming to so many readers. . . . When I talk to someone I try to ask them about their work and hobbies other than radio and customs. I often tell people about my work and they say, "Oh, that seems so interesting.". . . I would like to know your thoughts on UFO detection, mentioned in the March issue. Do you believe they are a figment of people's imagination or that their gravity control field is orthogonally rotated from our present electromagnetics?

Hmm. UFOs? Well. It doesn't seem reasonable to me that so many thousands of people have been lying, crazy or confused all these years. I published an editorial in 73 a while back explaining what I think UFOs are and why we'll never pin them down . . . Wayne

NB6Y: In reference to the letter in the April, 1990, issue titled "Electric Blanket Mod Supply", I'm afraid that KEØUV changed his electric blanket from one bad frequency (60 Hz) to another (0 Hz plus 60 Hz ripple). May I recommend reading *Cross Currents* by Dr. Robert O. Becker M.D. (Jeremy P. Tarcher, Inc., 1990)? Melatonin secretion in human subjects may be changed at will by exposure to steady magnetic fields of the same strength as the Earth's geomagnetic field (0.2–0.6 milligauss). Melatonin is the hormone produced by the pineal gland. . . . normally adjusted according to the day/night cycle (biocycle). The effect of an abnormal biocycle is the production of chronic stress syndrome, decline in the immune system, etc. Exposure of a dividing cell to an unhomogeneous DC magnetic field causes a physical force to be exerted on the chromosomes or on one of the other microscopic structures associated with mitosis, . . . resulting in structural abnormalties in the chromosomes. As to the ripple, loss of consciousness can be produced by nulling out or reversing the flow of the brain's DC electrical information system with external DC currents or strong, steady magnetic fields. A greater loss of consciousness occurs with the addition of ELF frequencies (to 100 Hz) to the baseline DC current or magnetic field. Although exposure to strong DC magnetic fields, up to 15 gauss, had no effect, exposure to much smaller fields modulated at ELF frequencies produced significant measurable activities in the human brain, i.e. behavioral changes of an undesirable nature by altering the basic operation of the brain . . . So get rid of your electric blanket, your waterbed heater and your waterbed (noxious rays). Move or replace that electric clock on the nightstand two feet from your head. At two feet you're getting five to ten milligauss.

It doesn't take much of a filter to smooth out the ripple and thus avoid the AC field . . . Wayne

Kent Britain WA5VJB: Keep up the microwave articles. They are the future of amateur radio more than 20 meter DXing. You used to run around with Gunnplexers, so you understand. We have eight members of the North Texas Microwave Society in the Dallas area on 10.366 GHz SSB. These SSB rigs have a 40-50 dB advantage over Gunnplexers and plenty of scatter margin. 100-mile SSB contacts have become routine. Mountain topping? On the plains of Texas? These paths are 90% beyond the horizon!

So how about some articles, Kent? . . . Wayne

John Rodgers K0KYQ: The Gordon West code tapes got me to 5 wpm, but that wasn't good enough to make many contacts. I bought the ARRL tapes, but they were so poor in quality that it was difficult to tell the dots from the dashes. After 18 months I passed the 13 wpm test and now I'm happily making CW contacts. There's less QRM on CW and ops are more courteous.

Hmph, you've tried the rest, now try the best . . . see Uncle Wayne's tapes . . . Wayne

KJ6UX: I would like to acknowledge your initiative in recent editorials (. . . de K6MH, April 1990) in taking the global view of amateur radio as a participative intellectual exercise: "What would you like ham radio to be? I ask because right at this stage, you may be in a better position to bring it about than you realize. Radio amateurs are an asset to society, and they are a force. If we really get it together—coherent, proud, self-regulating, curious, innovative, vigorously self-respecting, our global fellowship could surface as one of the greatest forces for good on this planet." By bringing such people as Joseph Campbell and David Bohm into your editorial "conversations" you are taking the risk of being tuned out, but perhaps an infusion of "new thought" is the only thing that will save the amateur radio service. Obviously hams in general are protecting our frequencies from being taken for meaningful purposes, as Rich Richmond KA5S points out in the *73* February issue. Thanks again for prodding us to revive the concept of genuine heart-to-heart communication.

Thanks for the feedback, Nick . . . Jim

KC2CF: I must admit right off that I'm not a regular reader of *73*; . . . I must also admit that I'm not a very active ham. The ticket has been stuck on 2m for a long time now. I'm finally in the process of putting up a stick and getting an HF voice again after 10 years or so . . . So why am I writing you? Because of your " . . . de K6MH" column titled "Who's Killing Ham Radio?" (May, 1990) . . . You want more reasons that ham radio is dying? It's because of the wall of exclusivity that the amateur community has built around the hobby. It starts at the very bottom—at the retail stores that sell equipment. Try stepping into one and pretending that you know nothing about the hobby. You'll be completely lost. The products are all labeled like you are expected to know advanced engineering, and the sales personnel make no effort to talk up the hobby in simple language. . . Everyone tries so hard to sound like an expert. They all use the most complicated words to say the simplest things. Look at amateur equipment ads. Amateur equipment magazines. They're all the same. High-tech language. High-tech specs. Where's the fun? Why can't we talk up the light side of the hobby? Why doesn't a retail store hang out a sign that says "come on in and talk to the world"? Why don't we say to our neighbors that hamming is fun? In the "old" days of peaking and dipping, it might have been a problem. But today, with broadbanding, the engineers have left us free to enjoy the fun part of the hobby. Let's stop pretending that we're all Ph.D.s. Another problem is with the manufacturers. A couple of years ago I dropped out of the corporate lifestyle and decided to try to make a living and have fun at the same time (radical idea, eh?). I had this idea of opening a retail ham business with a new twist. I would go after exactly the young people and beginners that are missing from our ranks. I had a really interesting marketing plan to make it happen. And you know what? It was like banging my head against a wall to even get the manufacturers to return my phone calls and letters. The barriers were so well put up (to protect the exclusivity of their current dealers, I assume) that I was soon discouraged. The techniques varied from simply ignoring me to wanting everything from a five-year business plan, an enormous opening order, and a fully-staffed full-time repair department. Never mind that I was ready to invest my time and money in building their business in ways that HAD to work. They were simply not interested . . . It's just such a shame that here we sit, holding on to a hobby that could be, once again, the province of the young; an alternative to so many of the horrible things that kids get into these days. The equipment is easier than ever to use, and maybe soon no code. Ham radio could be BIG, but it will continue to slide downhill because we are so scared that the public will find out how little we hams REALLY know about electronic theory, and how easy it is to talk to the world.

W4UMC: Your editorial suggestions (. . . de K6MH, March 1990) may be well taken in some cases but the bottom line is that ham radio is a hobby and therefore means different things to different people. Since it's a hobby, each person is entitled to do his own thing even if it means talking about the new equipment that he just purchased for an arm and a leg. I have since listened across many bands and indeed find all types of subjects being discussed. I listen on the HF bands more than I talk and I have heard a great many interesting QSOs. Many more were routine, some were most educational, even brilliant, along with the deteriorating, argumentative, destructive, inane and ignorant vulgarity that advertises the inferior mental level behind the voice box of its owner. However, in our case this is a hobby being exercised in a free country, by free individuals of wide, if not extreme, diversity but with a common interest in THIS hobby, its equipment, modes, antennae, joys and the so-called cocktail converstions about and between fellow hams. Such discussions shouldn't seem unnatural or undesirable. In fact, some people are indeed turned off by discussing politics, special interest groups, etc. Some may need a prod but for most of us it's "enjoy" or QSY. But please, let's always "Live & Let Live." 73

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Cover by Alice Scofield

Eb WD9I bags the fox (WB8ELK balloon package).

DEPARTMENTS

FEEDBACK... FEEDBACK!
It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 17. You'll notice a feedback number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*.

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Contract: This is a legal document. Merely by reading this, you are agreeing to get out of your everlasting rut and try something new—like packet or OSCAR. This will keep you from making the Silent Key list without living a little.

Number 2 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1

Self-Policing?

When I visited Russia a couple of years back I was amazed to see firsthand what the Russian people put up with. I saw long food lines, even at midnight. I saw empty store shelves. And everything Russian-made seemed shoddy.

Now we're seeing some Russians saying, "We've had enough of this." But others, used to being guaranteed a living, whether they work or not, are resisting change.

As I remembered this experience I was struck by the parallel with bankruptcy of amateur radio today in America. We have a growing number of hams who are crying out in frustration over 25 years of stagnation and really fed up with the mess our bands are in.

On the one hand we're annoyed that the FCC has let amateur radio disintegrate to such a state. On the other we are increasingly worried that they are going to get fed up with us and do away with our hobby entirely.

I hope it will not be surprising to you to know that the FCC is governed by appointed politicians and run by bureaucrats. It also should be no news flash for you that though there are some government agencies which are doling out billions to eagerly waving hands, the FCC has been on a starvation diet for years.

So we view the FCC with annoyance and fear. How do you think the FCC sees us? Have you ever considered that? Well, on the one hand we brag about being self-policing. Then on the other, the first thing we do when we have a problem anywhere is file a complaint with the FCC. Self-policing? Give me a break!

Yes, I've discussed this in my editorials and recommended that every amateur take this self-policing concept seriously. I've asked that you stop turning to the FCC when you have a beef and figure out how to solve it yourself. Deaf ears. Thousands of deaf ears. Okay, I guess I can accept that you are too afraid to make waves. . . too lily-livered to stand up for what you know is right. I have a solution for you. It's one you're going to hate even more than my asking you to assume some personal responsibility on the air to help clean up our messes.

Speaking of messes, KV4FZ, the chap who's largely responsible for the mess on 14,313, stopped by my booth at Dayton. Herb seems to have dedicated his life to destroying amateur radio, all in the name of protecting it from a few maritime amateurs who are, in his mind, abusing our bands. The cure is infinitely worse than the disease. I found him utterly impervious to reason. Just what we need, a religious zealot willing to explode his version of a car bomb on 20m, wiping him and us out in the process.

So what's the answer to net jamming? To repeater wars? To ham suers? To pileups? To world class lousy operating such as a recent DXpedition which, taking absurdity to extremes, won a Dayton Hamvention award? The mind boggles.

The answer actually is simple, even if you hate my printing it. I'm going to tell it as it is. If your reaction is that I'm bashing the League, instead of sulking about it and hating me, I'd like you to point out in what way you think I'm wrong.

We're supposed to be self-policing, right? I hope we agree this is the way to go. Doesn't that put the responsibility flat on the doorstep of our national ham organization? What in heck is a national organization for, if it isn't to to see that its field is growing and healthy?

The ARRL, for completely self-serving reasons which I've explained in detail in my past editorials, managed, by accident, to halt amateur radio growth 25 years ago. In the process this also virtually wiped out the American ham manufacturing industry. And since the worst debacle in amateur radio history the League has done virtually nothing to improve the self-policing of our bands, to promote the growth of the hobby or provide leadership.

QST magazine, handbooks, contests and awards we've had. A cleaning up and rebuilding of our hobby we haven't had. It isn't as if we couldn't do what needs to be done, it's that we haven't had the leadership it takes.

We've got a thousand ham clubs which would be glad to pitch in and help clean up the mess on our bands. We've got hams working on newspapers, radio and TV stations everywhere who'd help keep the costs of a national PR effort minimal. Heck, massive PR is a cinch to get when you know how . . . I've produced a $99 video which tells exactly how to do it. We're using my PR system right now to promote our Astounding Sounds Audio/Music Tour and we're getting tremendous media coverage everywhere our caravan is stopping between New Hampshire and Chicago.

Here's The Program

1) The League should establish a Special Communications Team at headquarters. They should then make sure that every amateur is made aware that any problem they have should be reported to the SCT. This would include messes such as on 14,313 kHz, repeater wars, ham suers, antenna restrictions, serious TVI complaints, and so on.

The SCT, with the help of local ARRL affiliated clubs, should then Quash Radio Messes and make sure none of them ever even get to the FCC.

The SCT should take the initiative to convince their ARRL affiliated clubs to form QRM committees to help resolve interference, antenna legislation or other legal problems. Even the awful mess on some Southern California repeaters could, I believe, be cleaned up this way.

2) The League should establish a headquarters task force with the mission of rebuilding the growth of our hobby. This team could organize the national PR effort needed to get word out about our hobby to youngsters. We need to establish visibility if we're going to get kids to consider hamming instead of computer games.

Such a team would prevent nonsense like the current no-code mess which the ARRL Board of Directors screwed up so badly . . . making us look like idiots (again) to the FCC.

Such a team might even help prevent stuff like the embarrassing secret ARRL submission of a proposed digital communications rule change to the FCC which, once word got out, had to be retracted.

What Next?

Okay, let's say first that you disagree with me . . . that you think Wayne Green is all wet again. Let's say that you don't believe that the ARRL has any responsibility whatever for solving amateur radio problems or promoting amateur radio growth. Who then? The FCC? Why them? All they do is license us to use billions of dollars in radio frequencies . . . supposedly for the interest, convenience and necessity of the public welfare.

Just how providing amusement for a shrinking group of rapidly aging cantankerous old men is in the interest of the general public, I'm not sure. I'd hate to be faced with proving it in court. Heck, the rental income from our microwave bands alone would go a long way toward reducing the national deficit.

The FCC is so enthralled with the value of amateur radio that they cut the ham division staff from 18 down to two and a half people. No, I don't think we're going to find the leadership we need in Washington.

Perhaps you believe we shouldn't try to fix it just because it's broke. Maybe we should just continue on as we have and enjoy hamming as long as we can and not worry about the future. Is that what you want?

Those few who may agree with me that (a) something should be done and (b) the League is the only organization we've got to do it probably are feeling the same sense of frustration I am. No amount of my griping either on the air or in my editorials is going to unleash anything except retribution from the League. They won't get moving, they'll just get even. So if I can't get any action, how can you hope to do it?

No, one person can't do much against such a bureaucracy. In Russia they used to send individual troublemakers off to the gulag. But now, with hundreds of thousands getting together to complain, even the incredibly well-entrenched party officials are being thrown out.

One ham can't do much to change the League. Heck, we've recently seen four very influential hams try to convince the ARRL directors not to re-elect Larry Price as president. Their well-reasoned plea fell on blind eyes. Price's response was to attack the messengers, not the message. So he's president again.

One of the directors was so upset over what's been going on in the League that he made a special trip to visit me and ask me to help encourage the members to get rid of the party hacks who now dominate the board. He explained that these entrenched old-timers hold the membership in total contempt.

He pointed out that not one ARRL member in a hundred even bothers to try and read the highly sanitized board meeting minutes published in *QST*. Few bother to spend a dollar to get the Annual Report and fewer ever read it. So all most members know is just what the board and HQ wants them to know, no matter how far this is from reality.

I don't want to turn this into a *NY Post* scandal expose, even though I've been given documentation on corruption which would cause heart failure to true believers. The Silent Keys list is long enough as it is.

Let's ignore the messes for now and go to curing both their causes and to

Continued on page 80

Number 3 on your Feedback card

QRX . . .

EDITED BY LINDA RENEAU KA1UKM

Harrison Incarcerated

On April 19, 1990, Judge Jacob Mischler sentenced Harrison to 21 months in prison, a $125,000 fine, full restitution plus interest to each victim within five years, and three years of probation after he completes his jail term. Additionally, Harrison must pay $1,210 per month to the Bureau of Prisons for his confinement costs. Harrison has agreed to return any equipment he received from victims. The United States Probation Department, Long Island Courthouse, Uniondale Avenue and Hempstead Turnpike, Uniondale, NY 11553 will supervise the restitution. The Case Number is CR89-00575.

Martin T. Biegelman, on behalf of the United States Postal Inspection Service, thanks all of you who have assisted him in the successful investigation and prosecution of Michael Harrison. *And thank you, Inspector Biegelman, for keeping our staff and readers informed of the status of this case.*

RUDAK-2 Launch

The launch of RUDAK-2 and RADIO-M1 (RS-14), planned for April 12, 1990, was delayed because of a problem in GEOS, the geological research satellite, also part of the payload. AMSAT expects RUDAK-2 to be launched this month. All analog and digital transponders of the new RS bird have been tested and proclaimed ready.

Downlink frequency of RUDAK-2 is 145.983 MHz with a nominal output power of 2 watts rf PEP (max. 12 watts). Uplinks are on 435.016 MHz for 1100 bps (yes, 1100) Manchester FSK (just Fuji-OSCAR-20 and the MicroSats) modulation, 435.155 MHz for 2400 bps BPSK, 435.193 MHz for 4800/9600 bps RSM modulation and 435.041 MHz for Digital Signal Processing (DSP) experiments.

Before you use these uplink frequencies, check to make sure that RUDAK-2 has been fully commissioned by the RUDAK command stations. TNX *The AMSAT Journal.*

PR Docket 90-55

The ARRL Committee studying PR Docket 90-55 released its report in May, signed by First Vice President George Wilson W4OYI. While subject to board acceptance in July, the committee states that what the FCC is offering and what the ARRL will accept are very different. Briefly, the committee recommends:

1. Retaining the Novice Class license is essential.
2. Novice testing should be incorporated into the VE system.
3. VECs should be permitted to recoup examination expenses, provided no exam fees are charged to applicants under 16.
4. The Technician Class license must be retained.
5. Element 3A should be expanded by five questions. (Requirements would be as follows: Novice, Elements 1A (5 wpm code test) and 2; Communicator, Elements 2 and 3A; Technician, Elements 1A, 2, 3A. Upgrading from Novice to Tech would require passing Element 3A; upgrading from Communicator to Tech would require Element 1A.)
6. Certificates of Successful Completion should be issued to applicants who pass either Element 1A or 2 without qualifying for a license by passing another element.
7. Frequency privileges for Communicators should be as proposed in RM-6995, and 200W PEP output is acceptable. However, since the 5 wpm code test would be the only difference between the Communicator and Technician qualifications, the committee could find no rationale for denying Communicator control operator privileges for repeater and auxiliary stations. Therefore, the committee recommends that the board reconsider the matter.
8. Technicians who have credit for Element 3B under the present licensing structure should retain this credit for upgrade to General after passing 1B (13 wpm code test).
9. In all other respects, that there be no departures from the ARRL position adopted in RM-6995. TNX *Bill Pasternak, Amateur Radio Newsline, and ARRL News.*

High Altitude Ralloon Flights

Several weather balloon flights carrying amateur radio equipment going up to 100,000 feet in altitude are planned this summer. At this altitude the signals should be received more than 400 miles away from the launch point. You can obtain launch updates and information from the following sources: The ATV Net—3.871 MHz, 8 p.m. EDT Tuesdays; the AMSAT net—3.840 MHz at 9 p.m. EDT, 9 p.m. CDT, and 8 p.m. PDT every Tuesday; packet BBS systems nationwide, and the *73 Magazine* phone line BBS (under the ATV SIG) at (603) 525-4438. Launch schedule:

- June 30, 9 a.m. EDT. WB8ELK, *73* Headquarters, Hancock New Hampshire. (Come on up for the launch. Bring direction finding equipment if you wish to join in the tracking effort.)
- July 7, 9 a.m. CDT. KD0FW, Independence MO.
- July 14, 1300 UTC. K4BV, Crystal River FL.
- July 21, 9 a.m. CDT. NJ9Y, Champaign IL.
- To be Announced, W0RPK/WB8ELK/KA8TEF/KA8LWR, Des Moines IA & Bucyrus OH.

For a more complete description of these flights and frequencies, see this month's ATV column. TNX *to our editor, Bill Brown WB8ELK.*

Computer RF Virus?

The Army Communication Electronics Command has proposed to award a grant of up to $50,000 to a small business for initial study of Topic A90-217, "Computer Virus Electronic Counter Measures." The focus is on RF as a method to introduce viruses, according to the Department of Defense (DOD).

The grant is part of the DOD Small Business Innovation Research Program (SBIR), which makes financial grants for exploratory projects. For general information on the SBIR program, contact Bob Wrenn, OSD/SADBU, US DOD, Pentagon Rm. 2A340, Washington DC 203301-3061. (202) 697-1481. TNX *W5YI Report.*

Uniden for Education

Uniden America Corporation is offering a quantity of their HR-2510 transceivers to schools who have a licensed radio amateur on staff authorized to operate on 10 meters. The school must agree to install the equipment. When it is no longer in use, for whatever reason, the equipment must be returned for redistribution to another user. The radio cannot be sold or "re-donated."

The HR-2510 operates between 28.0 and 29.7 For information on how to apply for an HR-2510, contact Paul Davis at (817) 858-3300. TNX *Uniden.*

ARRL/CRRL Conference

The deadline for camera-ready papers is August 6, 1990 for submissions to the joint ARRL/CRRL Computer Networking Conference. If you wish to submit a paper, write Lori Weinberg at the ARRL (225 Main Street, Newington CT 06111) for an author's package. Or call (203) 666-1541; FAX (203) 665-7531.

Topics include, but are not limited to, HF packet, packet satellites, network development, hardware, protocols, software, packet services and future systems. This year the conference will be held in Canada, in London, Ontario on Saturday, September 22, 1990.

TNX again. . .

To all our contributors. You can reach us by phone at (603) 525-4201 or by mail *73 Magazine*, Forest Rd., Hancock NH 03449; on CompuServe ppn 70310,775; MCI Mail "WGEPUB"; GEnie, "MAG73"; and the *73* BBS at (603) 525-4438 (300-2400 bps), 8 data bits, no parity, one stop bit.

Foxhunt Radio Direction Finder

Homing in by sight and sound.

by Paul Bohrer W9DUU

How often have you wished for a simple RDF which could work on just about any band and provide you with both an aural and visual means of determining the direction of a signal? You may have wanted to find an errant transmitter, QRM source, participate in a serious search and rescue mission, or just have fun finding the "fox." Now you can do it.

Many DFers in the Indianapolis area have built and used the unit described here. The circuit processes information from two quarter- or half-wave antennas, and gives right or left indications of which way to turn the antenna or vehicle so you can aim at the source. This type of DF is called "homing" because it tells you which way to go to home in on the signal. It is not affected by signal strength, and as such will allow you to take readings on the move. This helps you to average out multipath problems. You might bear in mind, however, that signal strength readings are still valuable, as they help confirm when you are almost "on top of" the fox.

How the Circuit Works

IC-1 produces a square wave signal which is used to switch between the two antennas at an audio rate. The square wave from IC-1 also feeds through Q1, 2 and 3 with the result that there are square wave signals of opposite polarity applied to each side of the 0-center meter.

When no audio signal from the receiver is present, the 5k zero pot is adjusted so that equal amplitudes of opposite polarity square wave signal are developed across the 100 µF cap and the meter, with respect to the 4 volts reference from pin 6 of IC-2. Therefore, no DC voltage develops across the cap and meter, so the meter reads 0 center.

When a signal arrives at both DF antenna dipoles at the same time (the antennas are the same distance from the transmitter), the receiver FM detector will have no output since it sees no phase difference in the signal arriving at each antenna.

As soon as the antenna is rotated slightly, the FM detector in the receiver will produce a tone, the frequency of which is determined by the rate at which the antennas are switched. This tone is caused by the signal arriving at one antenna slightly sooner or later than the other. Due to this difference in travel time, it arrives at each antenna with a different phase.

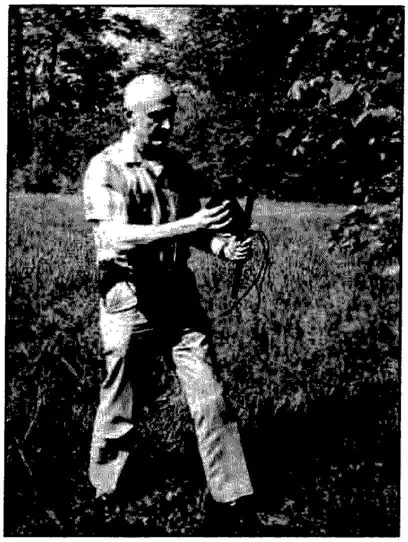


Photo A. Paul W9DUU with phase array DF unit in action.

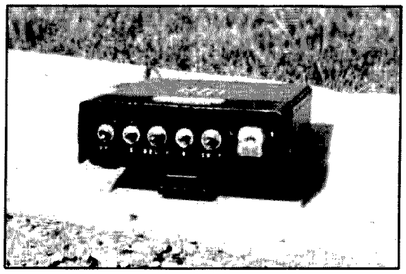


Photo B. The W9DUU DF unit. The earlier model was hand-wired. The new model uses a PCB.

This phase difference comes out of the receiver in the form of positive and negative pulses. See Figure 1(a). When these pulses are fed through the zero adjust pot to the meter, a DC voltage will develop across the 100 µF cap and meter, and the meter will deflect, say, to the left. If we rotate the antenna so that the opposite dipole is now closer to the signal source, the pulses out of the receiver reverse in polarity. See Figure 1(b). An opposite polarity DC voltage now develops across the 100 µF cap and meter, so that the meter deflects to the right.

Our circuit in effect is operating as a phase detector. This small DC voltage, developed across the meter, is used to turn on the upper left section of the 339 quad comparator when the meter swings left. When this happens, pin 2 goes low and turns on the upper right section, causing pin 13 to go low and turn on the left, or green, LED. When the antenna is rotated so that the meter swings from left to right, the upper two sections turn off and

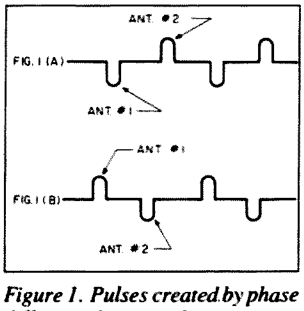


Figure 1. Pulses created by phase difference between the two antennas.

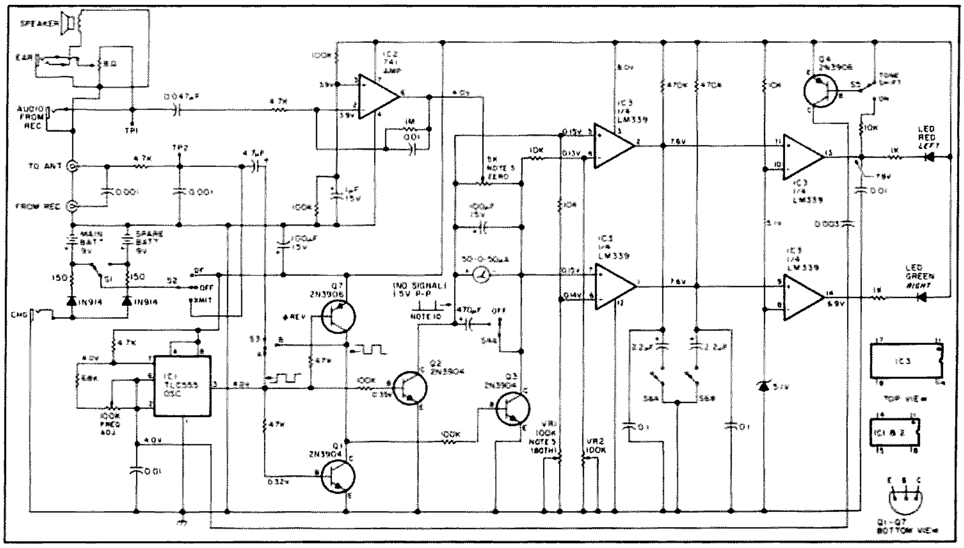


Figure 2. Schematic for the RDFing circuit.

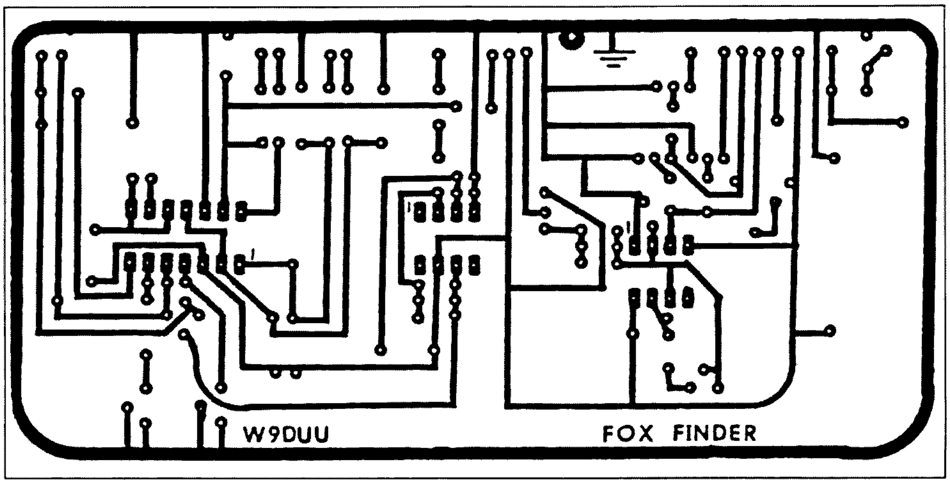


Figure 3. PC board pattern.

the lower sections turn on, causing the right or green LED to light.

Returning to pin 13 of the 339 for a moment, notice transistor Q4 in the upper right corner. Its base can be connected to pin 13 via the tone shift switch. If S-5 is turned on, whenever pin 13 goes low, indicating a signal to the left, it will turn on Q4. This transistor serves as an electronic switch; when on, it switches the 0.003 µF capacitor (which is connected to the collector) to the supply bus.

This produces the same effect as connecting the 0.003 capacitor across the 0.01 cap which is hooked from pin 2 to ground of IC-1. The frequency of the 555 oscillator is lowered, causing the pitch of the tone heard from the speaker to go lower. Therefore, a LOW tone indicates LEFT, and a HIGH tone indicates RIGHT. Instead of watching the meter or LEDs, you can listen to the pitch of the tone. This will buy you points with your local police and your insurance agent (no collision forms to fill out—I'm sure they would prefer that you watch the traffic instead of your DF unit)!

Returning to the circuit, the two 2.2 µF caps connected to S-6a and S-6b are used as sample and hold capacitors. When S-6 is positioned to ground the negative side of the two caps, they provide a two-second delay indi cation of the LED or tone direction reading. This is helpful when DFing kerchunkers

Table 1. Parts List

Qty.	Part	RS#			
			1	0.047 µF	272-134
1	555 timer	278-1718	2	0.1 µF	272-135
1	741 op amp	276-007	1	1 µF 35V tantalum	272-1434
1	LM339	276-1712	2	2.2 µF 35V tantalum	272-1435
3	2N3904 or equiv.	276-2016	1	4.7 µF 35V elect. axial	272-1012
2	2N3906 or equiv.	276-2023	2	100 µF 35V elect. axial	272-1028
2	ECG 553 pin diode		1	470 µF 16V elect.	272-957
1	5.1V zener diode	267-565	1	5k PC mount pot.	271-217
2	1N914 diode	276-1122	3	100k miniature pot.	271-284
1	red LED	276-041	1	8Ω stereo fader control	270-047
1	green LED	276-022	3	mini SPDT, S-1,S-3,S-5	275-625
1	p.c. board	276-168	1	mini SPDT (center off), S-2	275-325
1	box (user choice)	270-223	1	mini SPST, S-4	275-624
2	mini jack	274-247	1	mini DPDT, S-6	275-626
1	mini plug	274-286	2	150Ω	271-1312
1	coax power jack	274-1565	1	470Ω	271-019
2	SO-239 jack or BNC	278-201	2	1k	271-1321
1	2" speaker	40-245	3	4.7k	271-1330
2	battery snap connector	270-325	4	10k	271-1335
2	9V NiCd battery	23-126	2	47k	271-1342
2	9V bat. holder	270-326	1	68k	
5	0.001 µF	272-126	4	100k	271-1347
1	0.003 µF (use 3 of the 0.001 µF caps)		2	470K	271-1354
3	0.01 µF	272-131	2	1MΩ	271-1356
			1	50–0–50 uA center zero panel meter	

Note: Meter Sources:

Any center zero meter can be used as long as its in the 50 to 100 microamp deflection range. The Radio Shack 0–15 volt panel meter can be used by moving the indicator to center position with the position screw. Also the following two companies have appropriate meters:

A 100–0–100 uA meter (part # MHE 5) is available from Hosfelt Electronics, Inc., 2700 Sunset Blvd., Steubenville, OH 43952. Phone: (800) 624–6464.

For a larger meter display you can use the Triplett 320-WS which is available from A.R.E. Surplus, 15272 S.R. 12 E, Findlay, OH 45840. Phone: (419) 422–1558. Blank PC boards are available from the author for $15 ppd.

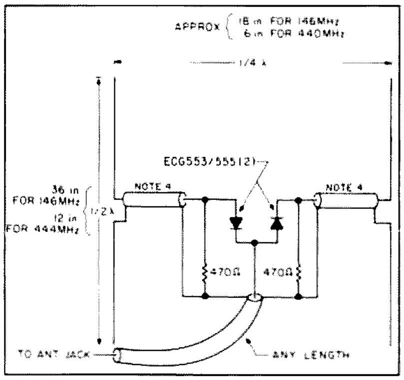


Figure 5. Antenna construction.

Table 2. Construction Notes

1. Battery voltage = 8 when readings were taken. V on LM339 pins 1, 2, 4, 5, 6, 7, 13 and 14 depends on the setting of VR 1 and 2.
2. Battery drain = 7 mA no signal, and about 13 mA with signal applied (L or R LED lit).
3. Antenna and receiver jacks should be counted as close together as possible. Use short leads on the two 0.001 caps and the 4.7k resistor. Mount the 4.7k resistor at the antenna jack.
4. The length of the coax between the antennas and the switching diodes is not critical, however they should be exactly the SAME length.
5. Adjust the meter zero pot for zero meter reading. Adjust VR 1 and 2 so that the LEDs just extinguish. (No signal applied.)
6. With signal aplied, rotate antenna for maximum meter deflection. Adjust the receiver audio level to just produce full scale meter deflection.
7. Adjust the oscillator frequency for equal left-right meter deflection with signal applied. Use the highest frequency possible. Some radios will have more phase distortion at lower tone frequencies, and can even cause the circuit to show reverse direction reading.
8. Use S-4 in the ON position for averaging meter flutter when in high multipath areas, turn S-6 on to store LED left or right readings when DFing kerchunckers. Do not turn both S-4 and S-6 on at the same time as this will adversely affect your reading. Leave both switches in OFF position for normal DFing.
9. Circuit test: Connect a 1k resistor between TP1 and TP2. Meter and LED should produce a right reading with phase switch S-3 in the ON position and a left reading with S-3 in the OFF position.
10. The 8Ω stereo fader control potentiometer is used to control the volume to your earphone or external speaker independently of the audio level from your rig into the RDF unit.

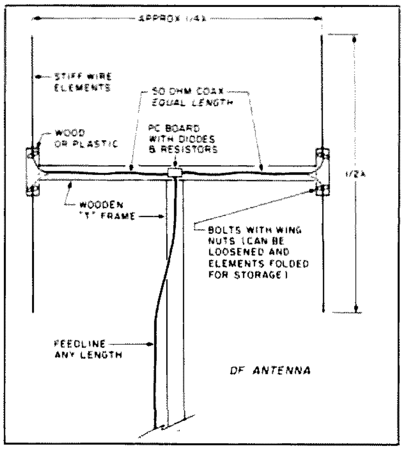


Figure 6. Mechanical mounting details.

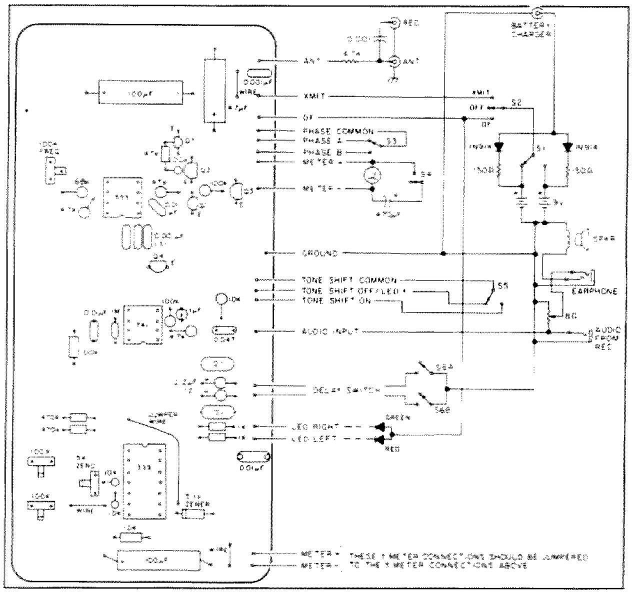


Figure 4. Parts placement.

or scanner local oscillators. See note 8 in Table 2.

Using the W9DUU DF Unit

The phase reversal switch S-3 is used in case you change receivers to a different one which may have the opposite polarity of audio output signal. This has the same effect as having your antenna backwards—your readings will also be reversed. I suggest a small label or legend on the DF unit to remind you of which position the phase switch should be in for each radio you may use. Otherwise, you may end up trying to find the fox in the wrong direction.

Like any other DF unit, you should practice with the equipment until you become familiar with its operation, and using it becomes automatic. There are always enough other things to provide distraction and confusion (multipath in particular), and you don't need to add unfamiliarity with your equipment to the list.

Construction is not critical, other than two items—see notes 3 and 4 in Table 2. You will no doubt want to build it in a rugged manner to survive the environs of mobile/portable operation and trekking through the wilds.

I hope this circuit may provide others some of the enjoyment I have had from the sport of foxhunting through the years.

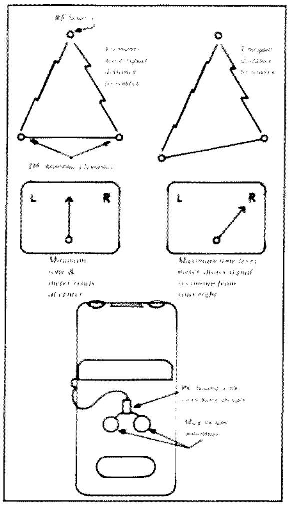


Figure 7. Operating hints: a) If tone sounds raspy and has high frequency overtones, you probably have some multipath signals. Move your position (if stationary) until tone sounds pure (no multipath signals). b) Take readings at high elevation and away from buildings, if possible. c) If in a vehicle, take readings on the move, and average out the meter fluctuations. d) Mobile antenna can be made from two quarter-wave mag mounts on roof of car. Watch for signal source direction change as you change direction of car.

Paul Bohrer W9DUU is an engineer for WISH-TV channel 8 in Indianapolis. You may reach him at 1813 Lilac Drive, Indianapolis IN 46227. This article was reprinted from ATVQ, *April 1989. Blank PC boards are available from the author for $15 ppd.*

The Hidden Receiver Hunt

Exciting sleuthing without expensive equipment.

by Robin B. Rumbolt WA4TEM

Nowadays, to compete effectively in a VHF or UHF transmitter hunt, you'd better have a Doppler unit or be prepared to settle for an "also participated" award. Hidden transmitter hunts have been providing sleuthing minded amateurs with the excitement of solving radio whodunits for years. I know of several groups who have become so proficient at finding transmitters that hunts with only one hidden transmitter are becoming too easy. Since the introduction of Doppler shift direction finders, loops and beams have been relegated to last resort status.

To extend the excitement of radio signal sleuthing to those not possessing high powered direction finding gear, I propose the idea of the hidden receiver hunt. That's right, I said hidden receiver hunt! No, this is not a watered down fox hunt with location descriptive clues being sent out. This type of hunt still requires map reading and triangulation skills, and it still requires practice to know which bearings are real and which are only reflections. Time is still a factor. You can still hunt multiple receivers. Best of all, you don't need any fancy DF gear to find the hidden receiver. This is a perfect activity for hamfests or club meetings, a unique twist on an established amateur radio sport!

The Mechanics

How does it work? Simple. The hidden receiver has the Doppler type DF unit attached to it. That means only one DF unit is required. Mobile units call the fox unit and ask for bearings indicating the direction from the fox to the mobile unit.

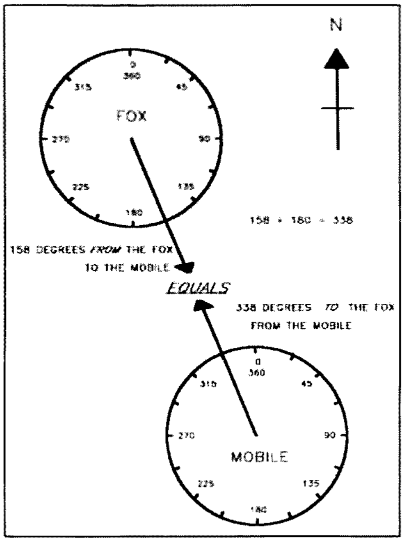
Suppose there are a group of mobiles trying to find the hidden receiver. Each mobile in turn asks the fox for the indicated DF bearing the fox to the mobile. When a mobile receives his direction bearing from the fox all he has to do is add or subtract 180 degrees from it to get the bearing to the fox. Add 180 if the received bearing is less than or equal to 180 degrees. He then plots this derived bearing on a map. A little later when the mobile has moved to a different location, he can ask for a second bearing. In a flat, open area this may be enough to get a fair idea of the fox's location. Here in the mountains of East Tennessee, we have a problem with reflections which necessitates numerous bearing requests, and provides a bit more challenge for fox hunters. The same will be true in metropolitan areas. It takes practice to tell a reflection from a "real" signal. So don't expect to ace these hunts without practice.

At the beginning of the hunt, each mobile has a score of zero. Each time a mobile asks for a bearing, five points is added to his score. If the mobile asks for a signal strength reading as well, an additional five points is added. The time of each mobile's first bearing request is also recorded. Each mobile has one point added to his tally for each minute of elapsed time between his first bearing request and the time he locates the fox. The hunt isn't over until all mobiles have found the fox or given up trying. Then, the mobile with the lowest score wins.

The Requirements

The only equipment each mobile must have is a radio capable of communicating with the fox, an accurate map of the hunt area, a protractor and a pencil for plotting bearings, and maybe a magnetic compass.

The fox must have a Doppler type direction finding system attached to a sensitive receiver with an S-meter that is separate from the radio he is using for communications with the mobiles. He needs a magnetic compass for getting set up. He will also need to have a log for keeping score.



The fox's setup is important since he will be providing the bearings on which everyone else relies. His DF unit must be aligned to north properly. The zero or 360 degree mark on his DF unit antenna must be aimed north. If all mobiles are using maps based on true north, then the DF unit must be aligned with true north. If the mobiles are using magnetic compasses, then the DF unit should be aligned with magnetic north. There is a difference. A call to your local airport should put you in touch with someone who knows what the difference (magnetic declination) is in your area. Pilots have to know that stuff. Here in Tennessee the difference is one degree. Big deal, but I had to mention it.

The fox should communicate with the mobiles through a repeater if the hunt area will exceed simplex range. As is true many times in VHF/UHF hunts, the trick is not so much locating the fox once you have the signal. The trick is getting close enough to the fox to hear the signal at all. It's the same in a hidden receiver hunt. The fox has to be able to hear the mobiles. He must also know when they have started hunting for score keeping purposes. If a mobile asks for a bearing or signal report and the fox can not hear him, that's valuable information for the mobile too. The mobiles should operate through the repeater. The fox should listen on the input of the repeater for getting DF bearings, and listen on the output of the repeater for communicating with the mobiles.

Mobiles having DF equipment can also participate in these hidden receiver hunts by tracking down the fox's reply transmitter signal. Fun can be had by all. If you're having a hidden receiver hunt and a hidden transmitter hunt combined, does that make it a hidden transceiver hunt?

I would like to thank Lyle Juroff K9FIK, a true DF nut, for helping me with the hidden receiver concept, and for nagging me into writing this article.

Contact Robin B. Rumbolt WA4TEM at 1134 Glade Hill Dr., Knoxville TN 37909.

Ten-Tec Service

Exceptionally personal. . .

by Gordon West WB6NOA

What a pleasure it is dealing with Ten-Tec! This wonderful factory with wonderful people is located in a "back home" surrounding in Sevierville, Tennessee. It has a unique distinction that sets it apart from all of the other amateur radio manufacturers—their equipment is built in the United States of America! It's good to see staying power after we have seen companies like Swan (Cubic), R.L. Drake, and Collins redirect their marketing efforts to commercial communications, away from amateur radio equipment.

To unfounded rumors, Sid Kitrell WØLYM/4, Vice President of Marketing at Ten-Tec, says, "Reports of our demise have been greatly exaggerated! We are alive and well. We also enjoy the largest share of the HF transceiver market than ever in our history. . . One of the greatest reasons for our continued success is our product support and service. We are fast, economical, and thorough. Typical turnaround time is five working days or less. When customers call, they talk to the tech that works on the model that the customer owns. Our service is the envy of the industry."

73 Magazine readers evidently agree—I received over 20 letters of praise for Ten-Tec service and no letters of dissent. Charles Ziegler W8RV wrote, "Just make sure your upcoming articles on service include Ten-Tec. I have had Kenwood, Yaesu, Drake, Ten-Tec, and Collins equipment, and each required service at one time or another. The Ten-Tec service provided the best and quickest repair of all—make sure your survey doesn't leave out Ten-Tec."

Here are the facts I discovered about Ten-Tec service:

- Average turnaround time: 5 days or less.
- Most common service problem: component failure.

Photo A. These new transceivers, made in the U.S.A., are inspected for completeness.

- Most common problem with equipment arriving from customer: little documentation of problem or symptoms.
- Warranty period, no charge for labor: 1 year; Titan amp, 3 years.
- Warranty period, no charge for parts: 1 year; Titan amp, 3 years.

Hourly charge for out-of-warranty repairs: $45.

- Average repair cost for most HF failures: $65.
- Turnaround time for parts orders: 3 working days.

Regarding out-of-band modifications: "Seldom do we see any out-of-band modifications attempted on our equipment."

Ten-Tec sends out a ". . . we have received for repair your Ten-Tec. . ." postcard, as well as a follow-up estimate on the repair charges. Their repair bill goes into detail on what took place at the technician's bench. "Ten-Tec Model 540, serial number 2524, replaced antenna relay and D4 and D5 on SWR-ALC board. Replaced dial cord. Replaced antenna jack. Realigned PTO, and realigned SSB generator. Check TX and RX—3 hours, set works great." The postcard includes a job number for positive identification, with room for any special notes.

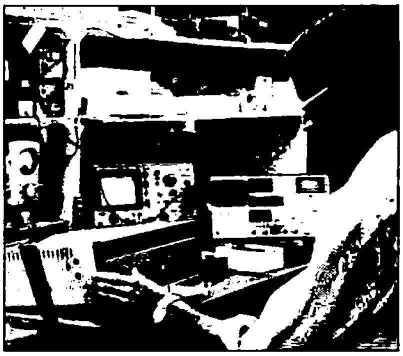


Photo B. At Ten-Tec, you can speak directly to the service technician who is working on your rig.

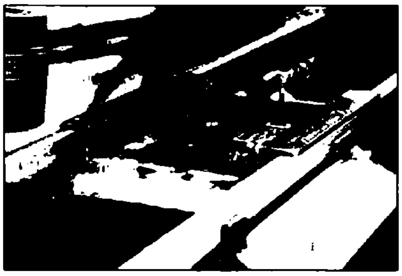


Photo C. All boards are wave-soldered to ensure positive connections.

More "Firsts" than Anybody Else

What would the Ten-Tec service manager like for customers to do before they call up? Attempt to troubleshoot the rig for the problem. And here's a first: Ten-Tec will send a replacement board for an easy swap! No other company we visited offers circuit boards swap-outs. In fact, most companies made it quite clear that replacement circuit boards were just not available for most of their equipment. At Ten-Tec, they're plentiful.

Here is another first from Ten-Tec: When Ten-Tec discovers that a component or other type of problem is causing recurring failures in a set, they ". . . send out a service bulletin to all of our registered equipment owners." This means that Ten-Tec sends out repair bulletins directly to the customer, even though the customer may not be having any problem with the equipment. Ten-Tec keeps its customers informed of potential, as well as actual, problems.

Ten-Tec service personnel indicated that there are at least 12 Ten-Tec dealers that may provide in-store service for their equipment. While Ten-Tec has no "emergency repair" available at the factory, I did notice a fellow passing through their city come in with a minor problem, and get it fixed during the lunch hour. Ten-Tec personnel also indicated that their servicing dealers will sometimes repair a set on the spot if it's a quick fix.

Ten-Tec continues to fix even their oldest of transceivers. "We have parts that go back for twenty years, and we still maintain stock of specialty mechanical devices, such as tuning assemblies," a Ten-Tec serviceman says.

And here's a third rarity in the service

- Service center incoming phone number: (615) 428–0364
- Parts department: same number as above
- Service Manager: Larry Worth
- Questions on operating your Ten-Tec equipment: (615) 453–7172. If this number is busy, call the service center number.
- Write Ten-Tec at 1185 Dolly Parton Parkway, Sevierville TN 37862. And, of course, package your rig well.

business: Ten-Tec is about the only one that actually lets you speak directly to the repairman working on your particular set. "This way, nothing gets lost in the translation—and here at Ten-Tec, no translation is necessary." As I scribbled this comment down during my visit, I thought it appeared to be a friendly swipe at the competing Japanese service bench technicians.

More from the Mailbox

Robert Ballinger N6QQO backs up this claim. "On June 26 I sent to Ten-Tec a very old, and very tired, and somewhat abused by its original owner transceiver. Garland Jenkins in the repair shop was extra courteous on the telephone, and indicated the repair would be under $75 after several items were fixed. Everyone was very polite, and everyone I talked to seemed genuinely interested in my repair problem. Three weeks turnaround time was well worth the wait when you could have seen what condition my set went back to them in, in the first place!"

George Scott W2LFX: "I would like to add my experience with Ten-Tec. In the past 13 years, I have purchased 3 different models; Triton 2, Omni-D, and now the Corsair I. The few problems I have had were quickly corrected by the Ten-Tec service factory. Immense help was given me right on the telephone without having to send my equipment back. Ten-Tec indicated they would send me the circuit board and asked that the old board be returned within 30 days. Sending out circuit boards to replace bad boards in the field is a delight—and they trust us as hams to return the old board without charging us for the new one."

Scott sums up his feelings, saying, "I guess they are the only ham radio company manufacturing in the U.S.A., and they're giving us the U.S.A. treatment we like."

Allen Fink K9DKJ: "Fast service! They also did some modifications to the power switch without my even having to ask." He adds, "I talked personally with Rick, who was a Paragon repairman. He was a very knowledgeable, helpful, and friendly person. I bought Ten-Tec because it is American made, and I am very happy with the transceiver and service at the factory. What a delight to be able to call the service technician who's actually working on the equipment."

So far, Ten-Tec service has achieved the highest satisfaction among *73* readers who responded to our service survey. I was impressed with the genuine down-home attitude of everyone involved at Ten-Tec. Sid Kitrell of Ten-Tec said, "...we're delighted to learn that we will be included in your service survey. Glad you could come on down and spend some time at our service center."

Ten-Tec service technicians look for problems in a piece of equipment with genuine interest, as if it were the technician's own rig.

Next month, the Yaesu service department rolls out the red carpet for "Gordo" WB6NOA, and makes some late-breaking announcements about regional service centers to back up their new modern service facility in Cerritos, California. ■

Number 42 on your Feedback card

Two Meter Tracking Transmitter

Low-cost beacon.

by Carl Lyster WA4ADG

Here's a simple 2-transistor CW transmitter that can generate up to 10 milliwatts of power on the 2 meter band. I originally designed this circuit for use as an animal tracking transmitter for the Tennessee Wildlife Resources Agency.

This circuit has a wide variety of applications whenever a low-cost signal on 2 meters is required. The Indianapolis Foxhunting Club has been using it for their "Easter Egg Hunts." They take several of these transmitters on different frequencies, enclose them in plastic eggs, and scatter them about the search area. The low power allows the trackers to easily walk right up to the hidden eggs without severely overloading their HTs or scanners. The trick comes in attempting to remove the eggs from the middle of thorn bushes!

This transmitter has also been used on two high altitude balloon flights. Its low current drain makes it a good choice for this kind of experiment. It's amazing what 10 milliwatts will do from 60,000 feet, as stations over 300 miles away were able to copy the beacon at an S-5 level. *[Ed. note: The package shown on this month's front cover used one of these tracking transmitters.]*

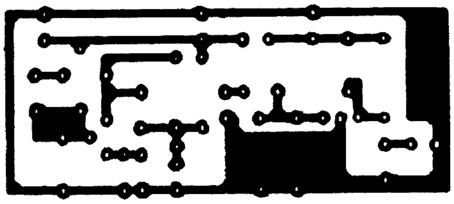


Figure 2. PC Board foil pattern.

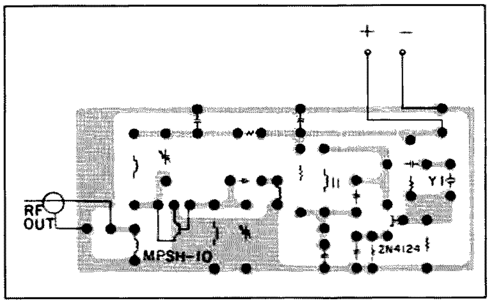


Figure 3. Parts placement.

Circuit Description

To keep this as low-cost as possible, the transmitter was designed to use inexpensive scanner crystals. Most VHF scanners use a third overtone crystal in the 48 MHz range. To find the 2 meter output frequency of a particular scanner crystal when used in this transmitter, just subtract 10.7 or 10.8 (depending on the scanner's IF scheme) from the commercial frequency. For example: a scanner crystal for 155.15 MHz would give the transmitter a 2 meter output on 144.35 MHz if the crystal was made for a scanner with a 10.8 MHz IF. Scanner crystals ranging from 154.8 to 158.7 MHz should put your tracker transmitter in the 2 meter band.

The oscillator section generates between 5 to 10 milliwatts of RF in the 48 MHz range. The output of the oscillator then drives a simple diode tripler to generate a signal at 144 MHz. The MPSH-10 transistor is used as a class-C amplifier, and it also helps clean up the final RF output. The closest spurs at 96 MHz and 102 MHz are at least 40 dB down.

Supply voltage to the transmitter is controlled by a 2N2222 transistor keyed by a logic level from your favorite CW Ider circuit. *[An appropriate CW IDer was described in the June "Above and Beyond" column. Another excellent choice is the GLB ID-1.]* If too much chirp is present, you might try leaving the oscillator running continuously and just key the final amplifier.

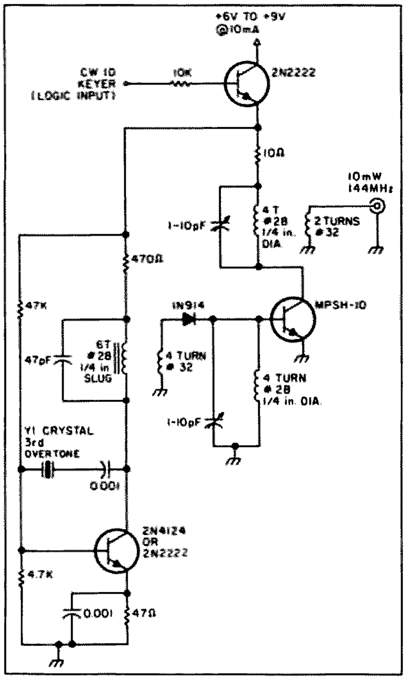


Figure 1. Schematic of the 10 mW transmitter.

Construction

The circuit can be built on perfboard with point-to-point wiring. However, I've included a PC board foil pattern which will make layout simpler. The 4-turn coil which couples the oscillator into the diode tripler can be wound directly over the 6-turn slug-tuned coil in the oscillator tank circuit. The 2-turn output coil is mounted in line with the collector end of the 4-turn coil in the amplifier tank circuit. Place the 2-turn coil as close as possible to the tank coil for maximum output power.

Tune Up

Build the transmitter up one stage at a time, starting with the oscillator. Apply 6 volts to the oscillator and make sure it's running. You should be able to hear its second harmonic on a stereo receiver set for 96 MHz. If the oscillator fails to start, try varying the slug-tuned coil in the tank circuit until it kicks in solidly. If this fails, you could increase the value of the 4.7k resistor or lower the 470 ohm resistor feeding the tank circuit.

Once the oscillator is functional, build up the tripler and amplifier section and place a small dummy load on the RF output. Adjust the input and output variable capacitors for maximum RF out. A grid dip meter or spectrum analyzer would be helpful at this point. However, you could simply adjust for maximum signal on your 2 meter rig's S-meter. Don't try to get more than 10 milliwatts out of this transmitter, as spectral purity will suffer. There will be some chirp with this circuit, especially if you key both the oscillator and amplifier. Chirp can be minimized through adjustment of the slug-tuned coil in the oscillator.

The transmitter works best with a supply voltage between 6 to 9 volts and draws about 10 mA. Any 9-volt battery should provide a reasonable operating life. For extended transmission times, you could use some of the newer Lithium 9-volt batteries.

The tracker transmitter can be enclosed in some extremely small packages which can be a real challenge to find during a foxhunt. Even though this is a CW transmitter, it can be easily heard with an FM receiver, so everyone can join in the fun! 73

You may reach Carl Lyster WA4ADG at 4412 Damas Rd., Knoxville TN 37921. This article was reprinted from the July 1989 issue of ATVQ.

Parts List

Qty.	Part Description
1	2N2222 transistor
1	2N4124 (or 2N2222) transistor
1	MPSH-10 transistor
1	1N914 diode
1	¼" slug-tuned coil
1	Scanner crystal, Y1
	#28 wire, short length
	#32 wire, short length
2	1-10 pF variable capacitor
2	0.001 µF ceramic capacitor
1	47 pF ceramic or mica capacitor
1	10 ohm ¼ watt resistor
1	47 ohm ¼ watt resistor
1	470 ohm ¼ watt resistor
1	4.7k ¼ watt resistor
1	10k ¼ watt resistor
1	47k ¼ watt resistor
1	PC Board

Note: A blank PC Board is available for $3 + $1.50 postage/handling from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

Feedback#	Title
1	Letters
2	Never Say Die
3	QRX
4	Foxhunt Direction Finder
5	Hidden Receiver Hunt
6	Ten-Tec Service
7	Ham Profiles
8	You Are Here
9	Transmitter Hunting Safety
10	12-volt Drive Conversion
11	Return to Kit Building
12	Review: ICOM CT-16
13	Review: Ameritron Coax Switch
14	Hamfest Shopping
15	Turnstile Antennas
16	PK-232 Connect Memory
17	Audio Patch Panel
18	Review: AR-880 Pocket Scanner
19	ATV
20	Hamsats
21	C-64 Inductance/ Capacitance Meter
22	Hooked on Foxhunting
23	Ask Kaboom
24	New Products
25	Packet Talk
26	Special Events
27	Above & Beyond
28	RTTY Loop
29	Ad Index 7/90
30	Keyword Index 7/90
31	DX
32	Dealer Directory
33	73 International
34	Barter 'n' Buy
35	QRP
36	Homing In
37	Looking West
38	Notes from the ELK
39	Propagation
40	Updates
41	Ham Help
42	Two Meter Tracking Transmitter

Number 7 on your Feedback card

HAM PROFILES

There are no "average" hams!

A Real Brass-Pounder

Eight-year-old Avraham "Avi" Moshe Broges KB2JFU is the youngest member of LIMARC and, says Lloyd Mills WB2ZIT, "...a real sweetheart of a kid. His rig is eight times as old as he is and twice as heavy."

The son of Aaron Broges WC2C, Avraham KB2JFU is a third grade student in yeshiva. Space exploration and electronics are among his favorite scientific interests, and he enjoys math and computers. Twice a week he goes to karate class. Other times find him building with Construx™.

According to WB2ZIT, Avraham KB2JFU is "a real brass pounder, so look for him on the CW Novice bands." What he likes the most about amateur radio operation is meeting people all over the world. He's made several DX QSOs, including one with Israel, as well as QSOs all over the country. He also listens regularly to the ARES net.

KB2JFU's father, Aaron WC2C, has been a ham for four years. Late last October, he began coaching his son for the Novice license tests, which Avraham passed in December. This summer, Avraham will study with his father for the Technician Class license. His father knows the secret of successful teaching: keep it fun. To a great extent, this means short but regular sessions. They study theory about thirty minutes a day, and CW about twenty minutes. Aaron says he never pushes his son to study.

CW comes in handy for father and son, as they use it as a private language in other situations. No doubt KB2JFU and WC2C will have plenty to talk about in the years ahead. *[TNX WB2ZIT for sending us KB2JFU's profile.]*

ATV DXer

Rick Redoutey WA8UMT of Novi, Michigan, has been a ham since 1966. His interest in the hobby was sparked when he was given a Heathkit GR-81 receiver for his tenth birthday. As a result of a ham merit badge project in the scouts, he became a licensed ham at the age of 15.

Although you can find Rick on the low bands during contests (most recently in the Michigan QSO party operating from a rare county), he gets the most enjoyment operating Amateur Television (ATV) on 439.25 MHz. In particular he likes the challenge of working DX via this mode.

During his job repairing video products at the Sony factory service center he became intrigued with the idea of using video with amateur radio. Rick decided to try ATV after reading an article describing the 400–500 mile ATV contacts that resulted from the great midwestern band opening during the 1986 Thanksgiving weekend. He immediately jumped into the thick of ATV DXing and has since worked over 50 ATV stations in Michigan, Ohio, Indiana, Illinois, Pennsylvania, and Canada.

Rick currently works as a field service engineer for General Electric Medical Systems.

A Flying Ham

Jim Skala WA8VWY has been a ham since the spring of 1963. He wasn't very active on the ham bands until after graduating with an engineering degree from the University of Akron in 1967. At that time, his primary interests were working on 6 and 2 meters. He combined his love of computers with ham radio and developed an excellent code practice program for the VIC-20 which is still used today by many hams (VWY Code Practice).

Jim is an IFR rated pilot and has logged many hours in his Cessna 182. He will soon be working on a high performance, home-built experimental plane. While working on a consulting job in Bloomington, Illinois, he commuted via his Cessna each week back to Akron, Ohio (a distance of 350 miles). Jim decided to hook up a packet station onboard his plane complete with a Radio Shack model 100 laptop so that he could keep in touch with his friends below. Not only did he make as many as 50 contacts as he flew along, he also allowed stations in a several state area to work through his airborne digipeater alias "AIR." At his cruising altitude of 12,000 feet, connects were made with stations as far away as Iowa and Pennsylvania.

During the summer of 1987, Jim operated ATV from his weekly flight, allowing dozens of hams in Ohio, Indiana, Michigan, Illinois, and Iowa to fly along with him. He provided many ATVers with consistent 140 mile DX contacts from his plane.

When not flying the BIG planes, Jim really enjoys his R/C models which he operates on the 53 MHz ham bands. He loves the fast aerobatic R/C models since he can perform maneuvers he'd never dare with his Cessna. His favorite model is a Northstar Water Plane which he can take off and land on a lake or pond. In fact, it has no wheels of any kind!

Jim currently works at SAIC in Huntsville, Alabama, as a Systems Engineer.

You Are Here

Two ways to prove it.

by Timothy G. Knauer NY9F

In an uncharacteristic move, almost every branch of the U.S. government has agreed to support a single positioning system called the Global Positioning Service (GPS). GPS is one of two prominent, competing systems for locating yourself on the globe. (Actually, there are at least five or six currently used by various government agencies and divisions of the armed forces.) The other prominent system, LORAN-C, is used largely by private aviators and mariners. Although the DOD is withdrawing its support of everything except GPS, the U.S. Coast Guard has vowed support for the LORAN system at least until the end of the 1990s. LORAN is being enhanced to support coverage within the central regions of the United States. This work is due for completion in the spring of 1991.

There are few GPS receivers that are reasonable in price for a consumer product. Current LORAN receivers cost from several hundred dollars to several thousand. (Sounds like ham radio gear?) GPS receivers are as low as $3,000 in single quantities at the low end to about $70,000 for the best surveying equipment. However, look for some GPS board sets for under $1000 later this year. Several Japanese car companies are reportedly working on a GPS system that will display location. The position would be shown on a map drawn from data stored in a CD ROM.

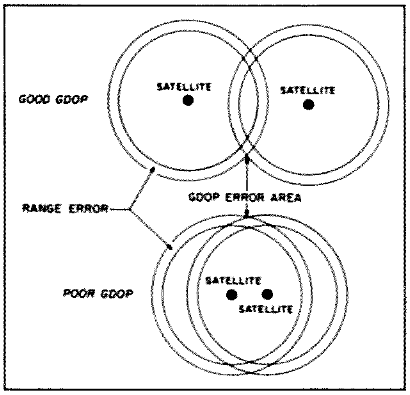


Figure 1. Geometric dilution of precision.

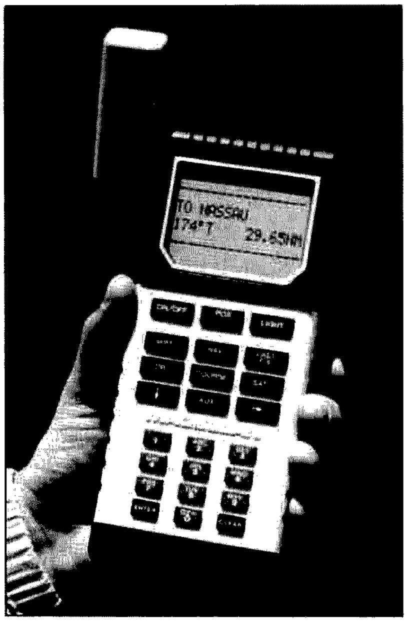


Photo A. Magellan hand-held GPS

GPS is a passive satellite location system. The user is required to carry only a receiver to find his location on the Earth or in low Earth orbit. An unlimited number of users may use the system simultaneously. The system consists of three sections: the satellite constellation, ground support and the users. GPS is sponsored by the Department of Defense (DOD), and therefore some strings are attached.

The Satellites

The full satellite constellation consists of 21 satellites, with three in-orbit spares. The current (May 1990), status is 13 operational satellites providing partial coverage. Partial coverage means that there will be 3-dimensional coverage, but it is not continuous. (Lat., Long. and altitude) However, there will be 24 hour 2-D (Lat. & Long.) coverage beginning mid to late summer of this year. (The NAVSTAR satellites are too large to be launched from anything but the largest expendable launch vehicles and the space shuttle. The Challenger accident was a setback for the program.) The full constellation may be completely operational by 1992. The constellation will provide coverage for all of the continental United States (CONUS), and most of the rest of the globe. Each satellite weighs almost a ton and is placed in one of six circular orbits at an altitude of 10,900 nautical miles. This altitude is about half of the altitude for a geo-stationary orbit, and was picked to provide an orbital period of exactly 12 hours. It is possible to visualize the constellation of satellites as staying fixed relative to the stars, with the Earth rotating underneath. This means that until all satellites are orbited, the periods of coverage will occur four minutes earlier each day.

Ground Support

The GPS system is maintained by the Department of Defense on a daily basis. Ground controllers monitor the integrity of the system, and closely follow the ephemeris (orbital data) of each satellite. Deviations from the predicted orbit are noted and uplinked to the satellite. The satellite can then pass this information along to the users in the form of a correction, resulting in a more accurate position fix.

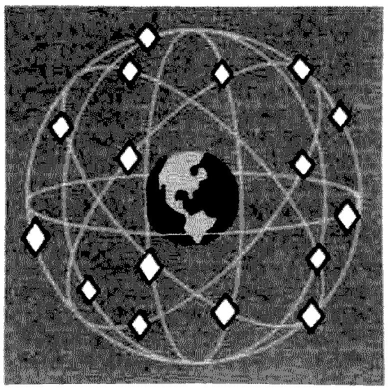


Figure 2. GPS satellite constellation. (Diagram courtesy of Magellan Systems Corp.)

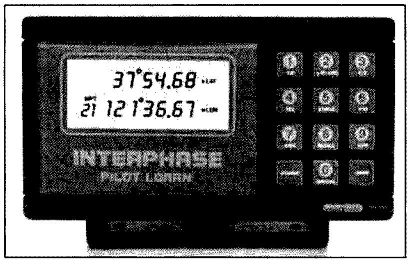


Photo B. Interphase LORAN C

Because the system is primarily a military program, there are some caveats. The system is intended to have two levels of accuracy: one for civilians and one for the military. The military had hoped for accuracies of 10 meters SEP. A maximum accuracy for civilians was to be about 30 meters SEP. In practice it has been shown that military accuracy can be achieved using the civilian system. Therefore, the DOD has a policy of S/A: Selective Availability. In short, they reserve the right to degrade the quality of the civilian code to approximately 100 meters accuracy. It is uncertain when and if the policy would be implemented. It is probable that it would be used only in times of national emergency, and for testing purposes. Also note that 100 meter accuracy is an exceptional positioning ability. Should S/A be implemented, the user will be aware of the error, but unable to resolve it. By using a technique known as differential GPS, positional accuracies across several kilometers can be on the order of millimeters.

User Segment

The user segment consists of both civilian and military users. A typical receiver system will have three parts: the antenna, receiver/navigation computer, and a Control Display Unit (CDU).

The navigation solutions consist of latitude, longitude, altitude and time. While under 2-D coverage, altitude is unknown, or assumed to be constant. Additionally, the computer may also calculate velocity and direction. Navigation solutions may be produced as often as once per second. A data block from a GPS receiver should also contain a figure of merit. This would represent a statistical weight of the errors that a user can determine. (Some errors can't be determined by the user.) It is a measure of the accuracy of the navigation solution. Navigation data is usually available through a serial port.

GPS Positioning Principles

GPS positioning is based on knowing the distance to a group of satellites. GPS satellites transmit signals that tell the user exactly where it is in its orbit and the exact time that the signal was sent. Knowing the time it took for the signal to arrive provides the range to the satellite because the speed of a radio signal (speed of light, about 300,000 km/s) is a known constant.

With one satellite, the user's location could be narrowed to anywhere on a sphere, centered on the satellite. With ranges to two satellites, the user location is limited to a circle described by the two overlapping spheres. With a third range, the location is narrowed to one of two points where the three spheres overlap. One of the solutions is probably ridiculous, or gives an absurd velocity, and can be disregarded. A fourth range would unambiguously describe the user's location.

The obvious problem is, "How do all parties agree on time?". The satellites have an expensive solution. They each have four atomic clocks that can be reset by ground controllers when they drift. This works well for the satellite segment, but is unrealistic for the users. User clocks would have to be synchronized periodically, and would not be allowed to drift under any conditions of environment. A radio signal requires 10 μs (ten millionths of a second) to travel about 3000 meters. This puts a tremendous constraint on clock accuracy and drift. Fortunately there is another way. The user needs four pieces of information: latitude, longitude, altitude and time. This is very much like a set of algebraic equations, four equations and four unknowns.

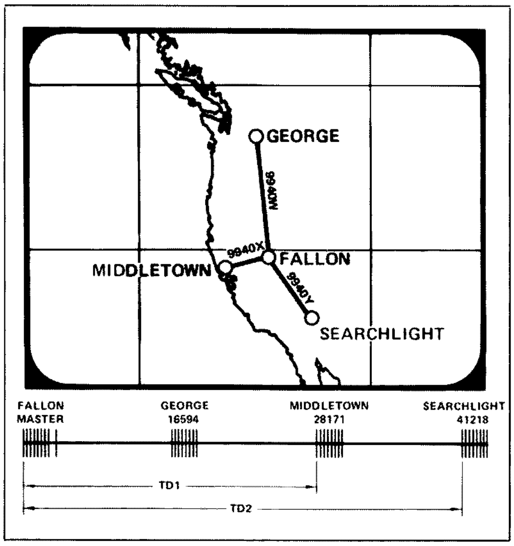


Figure 3. LORAN C time differences of the West Coast chain. (Chart courtesy of Micrologic.)

Therefore, the remedy is a fourth ranging measurement. Geometrically the extra solution provides a set of impossible locations: A user cannot be in more than one place at a time. By adjusting the receiver clock in such a way that the solutions converge, the timing errors can be eliminated. The key is to remember that any timing errors on the part of the user will be off by the same amount, no matter which satellite is used. The satellites all agree on what time it is.

GDOP (Geometric Dilution of Precision)

GDOP (pronounced "GEE-DOP"), is an error that is known to the user, but cannot be resolved. It is a direct result of the satellite geometry. The best configuration of four satellites (the simplest case) would be three satellites near the horizon, spaced at 120 degrees, and one near the zenith.

Each satellite range has an uncertainty, therefore it is referred to as a pseudo-range. Depending on the geometry of the satellites with respect to the user, the uncertainty can be exacerbated. In Figure 1., two satellites with their pseudo-ranges overlapping, the navigation solution must be within the overlapping regions. The relative positions of the satellites determine the size of the box, and

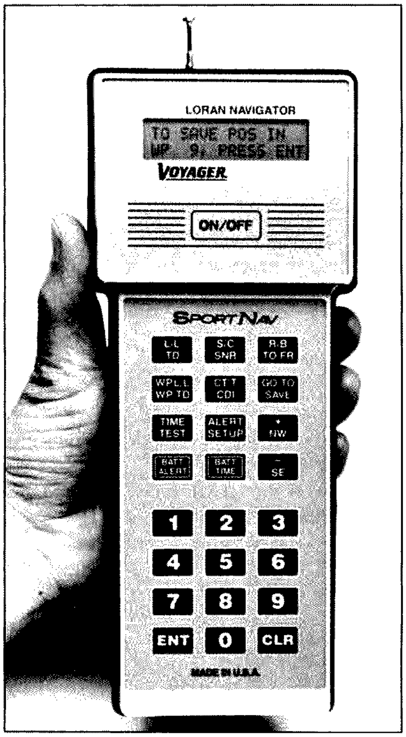


Photo C. Micrologic hand-held LORAN C

therefore the error attributed to GDOP.

The receiver may also have to go through a restart process if it was moved (about 100 km) while powered down or without satellite coverage. It may take longer to make the first navigation solution, but the user should not have to become involved in providing approximate time and location. Once a satellite has been acquired, the unit can receive ALMANAC data for the the rest of the constellation from the single satellite. The almanac data includes ephemeris and health data for the rest of the satellite constellation.

GPS Antenna Placement

NAVSTAR satellites must be visible to the user; that is they must be in a line-of-sight to the antenna. (Navigation solutions are valid for the antenna position.) A minimum of three satellites are required for a 2-D solution and four are required for a 3-D solution. (A 2-D solution is a position on a map and time. 3-D solutions are latitude, longitude, altitude and time.) The satellite signals do not penetrate dense foliage, buildings or hills. GPS antennas do not look like traditional mobile

"whip" antennas. In fact, they can be formed to a very low profile.

A Brief Description of Spread Spectrum

To the casual observer, a radio station operates on an assigned, single frequency: for example, 107.9 MHz. As hams know, only perfect sine oscillators occupy a single frequency. The commercial FM station in the example actually uses a set of frequencies—a bandwidth—of about 30 kHz, centered on 107.9 MHz.

This type of transmission is called narrowband. It means that the useful information in the signal is contained in a relatively narrow bandwidth. This is the way most radios operate. A narrowband signal is susceptible to natural and man-made noise. They are also inherently subject to deliberate interference.

In 1939, techniques were found to spread a signal over a broad spectrum of frequencies. The energy in the signal is spread over a range of 10 to 100 times the bandwidth required for a narrowband signal. The total energy is the same. This lowers the signal-to-noise ratio, and makes the transmission invisible to traditional narrowband receivers. A receiver that complements the spread spectrum transmitter can be built to recover the information in the signal, even though the signal may have less energy than the natural noise at that frequency. In addition to being naturally "stealthy," the spread spectrum transmission is almost impossible to deliberately jam. Because of these properties, the technology remained a secret until after World War II. (In fact, Churchill and Roosevelt used an ingenious spread spectrum technique to communicate throughout the war.) Spread spectrum technology remained classified until publication in the Journal of the IRE by Shannon, in 1949.

Spread-spectrum technology also allows satellites to share the same set of frequencies without interfering with each other.

GPS Applications of Spread Spectrum

GPS uses a system of two frequencies in L-Band; specifically 1575.42 MHz (L1) and 1227.6 MHz (L2). There are two distinct spread spectrum signals sent by each satellite. Each signal follows a different spreading code. The two codes are referred to as the C/A and P code. The C/A code (Course or Civilian Acquisition), is transmitted only on L1. The P-code (Precision or Privileged) code is transmitted on both L1 and L2. Civilian use of GPS is limited to the C/A code. The P-code is a pseudo-random code: a pattern that repeats every 267 days. Military users are given a "key" that allows their receivers to reconstruct the P-code anywhere along in its sequence. In this instance, the C/A code is used to sync-up with the more precise P-code.

Ionospheric diffraction causes the satellite signals to take a longer and less predictable path to the user, thereby introducing a timing error into the solution. The use of two frequencies allows military users to significantly decrease the error caused by diffraction.

Various models for ionospheric diffraction have been used in C/A code receivers. This is one way that civilian users have achieved near-military accuracies. It is also possible to operate a differential GPS setup without any knowledge of the P-Code, and still get 1 ppm accuracies, or better.

LORAN-C Description

LORAN-C is a refinement of a system that was first implemented in the 1950s. Like GPS, it is a passive system. Users are required to have receivers only. Time information can be derived from LORAN transmissions, but it is not intrinsic to the system data. Altitude information is not available from the system. The system provides a 2-D position on a map. Accuracies are somewhat less than can be achieved with GPS. Precisions (repeatabilities), can be in the 20–60 meter range. The best part is that LORAN receivers can be purchased for as little as $220.

The system uses a chain of transmitters that use a frequency of 100 kHz. Virtually all transmitters use the same frequency. They occupy the same frequency by a scheme of time sharing. That is, each transmitter broadcasts a short signal at a different time than the other transmitters.

LORAN transmitters are arranged in "chains." Each station actually consists of a chain of three or more transmitters separated by several hundred kilometers. In each chain there is only one "Master" and at least two "Secondaries." At the appropriate time the Master transmits a sequence of pulses that uniquely identifies itself as a Master. At a

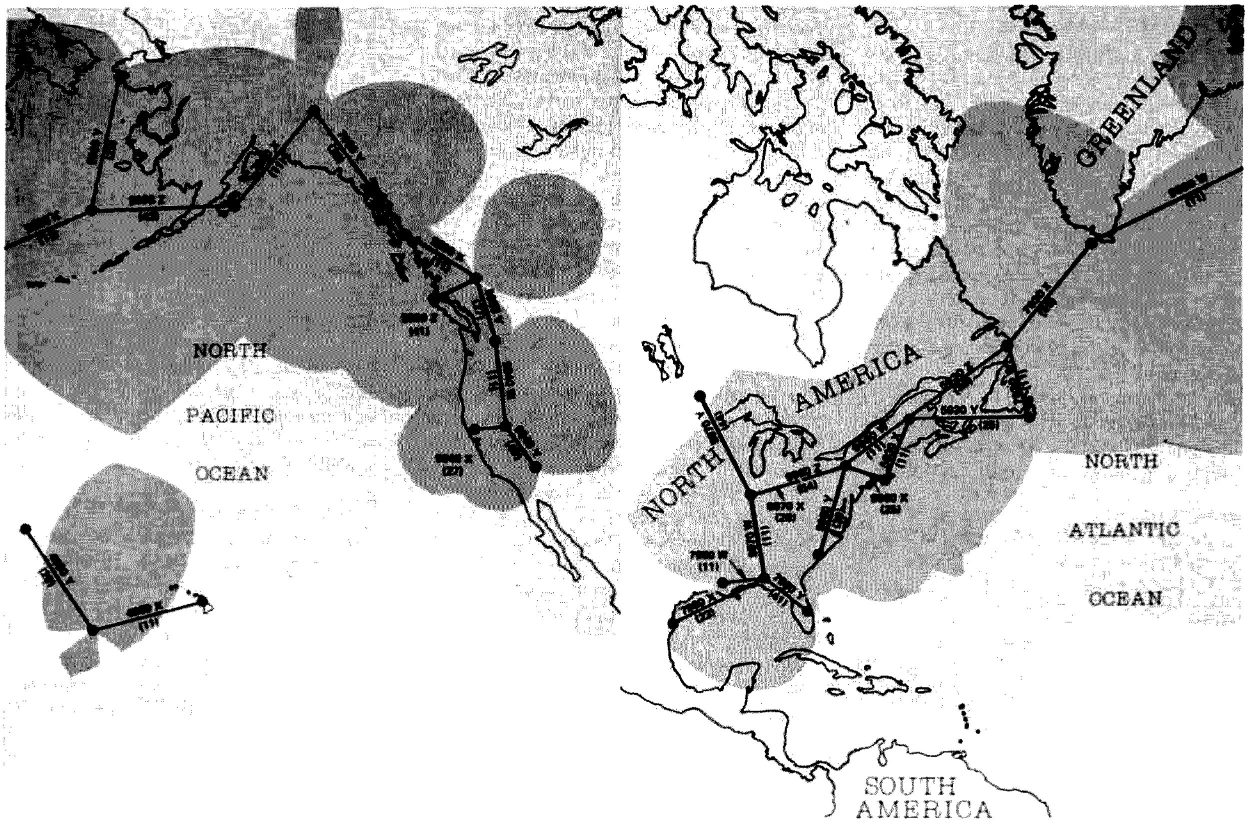


Figure 4. North American LORAN C system. Darker shaded area indicates best coverage. Lighter shading indicates conventional limits for reception. (Chart courtesy of Micrologic.)

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"1988 Federal Radio Navigation Plan," available through the NTIS and US Government Printing Office. Publishing Numbers: DOD-4650.4 or DOT-TSC-RSPA-88-4.

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Uncredited article, "Handheld GPS Navigator," *Microwaves and RF*, August 1988, p. 23.

precisely timed interval, a Secondary station transmits a similar pulse train. By precisely comparing the times of arrival of the signals, a user position can be determined. Each chain can provide coverage for about 1000 miles.

Standard LORAN Location

The LORAN-C locating system is a hyperbolic system. Each Master and Secondary within a chain transmits at precisely known intervals. If the exact time is unknown, the only known quantity is the time delay between the Master and Secondary. Since it is unknown how much of the delay is caused by the User-Master distance and how much is contributed by the User-Secondary distance, only the (unsigned) difference in the two distances can be derived. This is actually an interesting algebraic diversion. By starting with this premise, can you arrive at a hyperbolic solution?

If the exact time is known, then immediate ranges can be produced from the LORAN timing chain. This method is useful beyond the typical hyperbolic range of 1000 miles. However, very stable and accurate clocks are required. This would push the cost into, and perhaps beyond, the range of a GPS receiver.

The pulse string is very carefully shaped to use a minimum of bandwidth. The high-end LORAN receivers use this to their advantage. The signal may arrive at the receiver via both the ground wave and sky wave propagation. The sky wave is presumably the delayed signal. By carefully observing the start of the transmission it is possible to lock onto the ground wave before the delayed signal arrives.

The LORAN system was originally intended to provide coverage for coastal regions and the Great Lakes area. It is being expanded to cover the mid-continental gap. This is an area approximately surrounding the Rocky Mountains. The expansion is expected to be completed in the early 1990s.

The LORAN user can expect a position fix 20 to 30 times per minute. The first fix can become available within a few seconds after power-up of the receiver, to within several minutes, depending on the receiver and proximity to a transmitter chain.

Much man-made noise exists in the LORAN frequency range. In fact, the power utilities control remote facilities by modulating the power line voltage at about that frequency. This, and other noise sources prevalent in heavy urban areas can cause LORAN positioning to degrade significantly.

Direct measurements of velocity and direction are not provided by LORAN. Velocity and direction can be calculated by measuring at least two positions over a known time interval. The velocity measurement will not be as accurate as the GPS resolution of about 0.1 m/s.

Comparisons of GPS and LORAN-C

LORAN and GPS positioning are degraded for different reasons, but typically they are hurt most in the urban environment. GPS systems suffer from satellite signal loss due to shadowing. This is usually worst in an environment of tall, closely spaced buildings. The same buildings cause distortions in LORAN-C receivers. Both systems will work well in a rural environment. *[Ed. Note: Micrologic has a booklet available entitled "LORAN C Fundamentals" which provides an excellent overview of the system complete with a worldwide map of existing stations.]*

Hybrid GPS/LORAN Receivers

At least one manufacturer is building a truly hybrid GPS/LORAN receiver. The hybrid design is more than simply putting two receivers into a single box. The hybrid design takes advantage of the fact that GPS and LORAN systems suffer different types of degradation. The hybrids combine both outputs into a "best fit." At present, these are very expensive (more than $10,000). 73

Timothy G. Knauer NY9F works as a Sr. Electrical Engineer for Racotek. You can reach him at 12409 Birnamwood Ct., Burnsville MN 55337.

LOCATOR MANUFACTURERS

Magellan Systems Corp.
260 E. Huntington Dr.
Monrovia, CA 91016
1-818-359-4455
(Hand held GPS systems)

Micrologic
9610 De Soto
Chatsworth, CA 91311
1-818-998-1216
(Hand held LORAN C)

Interphase Technologies
1201 Shaffer Road, Dept. P
Santa Cruz, CA 95060
1-408-426-2007
(Low Cost LORAN C)

ORGANIZATIONS OF INTEREST

Wild Goose Association
P.O. Box 556
Bedford MA 01730
Attention: John Beukers, Secretary
If you have an interest in LORAN-C, an umbrella organization is the Wild Goose Association, named for the goose that unerringly navigates its way across North America, not from the famed "chase".

United States Department of Transportation
Transportation Systems Center
55 Broadway
Kendall Square
Cambridge MA 02142-1093
DOT: (617) 565-8121
TSC: (617) 494-2000
Contact: Franklin MacKenzie
Chief, National Field Office for LORAN Data Support
(617) 494-2324

Institute of Navigation
1026 16th Street NW #104
Washington D.C. 20036
Publisher of *Navigation*.

National Marine Electronics Association (NMEA
P.O. Box 130
Accord MA 02018
The NMEA-0183 standard Is a typical display I/O for a LORAN receiver. Sometimes this is the only I/O built into a LORAN receiver manufactured for marine or aviation applications.

United States Coast Guard
Office of Navigation Safety
(202) 267-2267
Radio Aids Navigation Branch
(202) 267-0294
These branches of the Federal Government administer the LORAN system for the CONUS and various international waters near US protectorates.

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Number 9 on your Feedback card

Transmitter Hunting Safety

Is foxhunting a blood sport?

by Alida Jatich KA9KAG

We call ourselves foxhunters, but we don't hunt down cute, furry, unsuspecting little foxes. Real sport, to us, demands an even match between hunter and hunted. In other words, we like to outwit PEOPLE. Why do some Chicago-area transmitter hunters claim that foxhunting is a blood sport? Isn't T-hunting a matter of trekking through the terrain with DF (direction-finding) gear to find a hidden ham? If it's just a grown-up version of electronic hide-and-seek, then what could these people be talking about?

A few years back, Phil Nowak KA9KAF met with a strange accident while T-hunting. At various times in the past few years, Phil and I have participated in the foxhunts held at 8 p.m. on Saturday nights in the Chicago area. When we first began T-hunting, our equipment was an ICOM 25A resting on the dash of our old Ford, a 4-element KLM yagi attached to the roof with a big homemade wooden rack, and a handheld Little L-per DF rig, for our final approach to the fox.

Haste Makes Stitches

Hunters generally meet at the starting point at least fifteen minutes before the hour. On one occasion, as usual, we were running a little behind schedule. We were in such a hurry that we failed to tighten down all of the little straps which held the roof rack onto the car. A few minutes later, Phil was driving in the left lane of the Eisenhower Expressway at 55 miles per hour. Suddenly he saw the ICOM 25A coming off the dash. . .and then, BLAM! Phil was hit in the face by a flying radio.

I heard a loud noise and saw some blood, but it took us both a little while to figure out what had happened. The antenna and the roof rack had fallen from the car roof at highway speed. The coax attaching the antenna to the radio had yanked the radio off the dash, so that it hit Phil in the right cheek.

We were fortunate in many ways: the radio did not hit anyone in the eye, the roof rack landed safely on the shoulder of the expressway, none of the car windows were broken, and the rugged little ICOM 25A landed undamaged in the back seat of the car, although the coaxial cable had broken. The emergency room people looked at Phil a bit skeptically when he told them he had been hit by a flying radio, then they billed him $200 for three stitches.

In the Dark

Phil wasn't the only ham to end up in a T-hunting mishap. Mike Brost WA9FTS is the Chicago FM Club foxhunt coordinator. He probably has as much foxhunting experience as anyone in the area. But on one occasion, he fell down a seventy-degree embankment near some railroad tracks, resulting in a dislocated finger and an emergency room visit.

Mike says, "I didn't have my flashlight. If I'd had my flashlight, I would have seen how steep the bank was. I wouldn't have tried to walk down the embankment; I would have climbed or slid down carefully."

4x4s Can't Go Everywhere

Mike also found out that even a four-wheel drive truck is no guarantee against getting stuck. There are definitely some places you just can't go! Mike and his T-hunt partner, Tom Galetka N9CBA, tried to take a shortcut through some very old railroad tracks. Mike's 4WD got stuck at a point where two of the tracks went over a ditch. All four wheels were up in the air! Like a true foxhunter, Mike sent Tom out of the truck to find the fox on foot, and then set about trying to free the truck with the help of several other T-hunters.

When the local police stopped by, the hams talked them out of calling for an expensive tow truck. Instead, the T-hunters dismantled an old walkway made of railroad ties, using some of the ties to fill up the ditch, and using another one as a lever to move the truck. Once one of the truck's wheels was on the ground, Bill Grossman KA9GZL was able to use his van to pull Mike's truck out with a tow chain. Then they reassembled the old walkway.

This story has a happy ending. . .Tom was the first to find the fox (on foot, of course)!

Navigating Obstacles

On one occasion, when Phil and I were the foxes, we chose a hiding place not too far from an expressway. We had some misgivings about this because we knew that at least one hunter had a habit of taking shortcuts across six lanes of expressway on foot. So, when we transmitted, we announced that we would disqualify any foxhunters seen crossing the expressway on foot.

This caused somewhat of an uproar: "The fox isn't supposed to make the rules!" But we wouldn't change our minds. The spectacle of people running across a busy expressway carrying big antennas would draw the wrong sort of attention to our sport from the public and the police, especially if an accident were to happen.

Another ham in our group hurt his knee when he landed badly after jumping over a three-foot barbed wire fence. My personal opinion is that barbed wire fences are good things to stay away from. There was certainly another way to get around that fence! T-hunting doesn't have to be a risky sport. You are in control; you can definitely win T-hunts without having to do anything you consider to be unsafe.

Keep in Mind...

Here are some guidelines that we ourselves keep in mind on foxhunts:

1. A moving vehicle is no place for loose or improperly secured heavy objects. Install a mount for your ham rig; don't just set it on the dashboard and hope it stays put. You can get locking slide mounts that let you remove the rig when you park the car.

2. Do you use a roof rack? Inspect it to make sure it is COMPLETELY secure. If it hooks onto roof gutters, are the roof gutters coming loose? Did you tighten all of the straps? Be aware that wind loading can put stress on your roof rack. The bigger your antenna and the faster you go, the more wind loading. You wouldn't want your roof rack to home in on someone else's car!

3. In our experience, the first T-hunter to get in the vicinity of the fox is NOT necessarily the first to find the fox. So don't take foolhardy chances while driving. ALWAYS slow down before you go around a blind curve or over the crest of a hill, because you don't know what's on the other side!

4. Be careful where you put your feet and make sure your footing is secure. If you T-hunt at night, you need a bright flashlight so that you can see where you're going as you approach the fox on foot. I've seen T-hunters wearing "coal-miner" lights on their hats, leaving their hands free to work the DF gear. Long pants (even in hot weather) and sturdy shoes protect your legs and feet against thorns and other scratchy objects.

5. Remember, T-hunting is just a hobby. If you keep it in perspective, it will be safer and a lot more fun. Things go wrong when people become impatient to get somewhere. They cut corners and do things they normally wouldn't do, and it doesn't always pay off. We had a good laugh at the expense of a T-hunter in our group. He arrived at the munchies spot dripping wet and smelling rather strange. Turned out that he had swum across a highly polluted canal to get to the fox—for second place.

By the way, Mike Brost WA9FTS wants to hear from fellow foxhunters and from hams interested in foxhunting. He might be able to put you in touch with other foxhunters in your area, or help you start a foxhunting group if there isn't one already. You can write to Mike at 5127 N. Monterey Drive, Norridge IL 60656.

You may reach Alida Jatich KA9KAG at the Cogito Corporation, 3835 West 56th Place, Chicago IL 60629.

C-64 & 1541 12-volt Drive Conversion

Put your blown disk drive to work.

by John Neeley K6YDW

If you have a Commodore C-64 lying around gathering dust because its power supply is blown and you don't want to buy a new one, here is a solution. With a few parts, you can convert both the C-64 and 1541 disk drive to 12 volts simply and inexpensively. Also, if you are interested in emergency communications as I am, this conversion will satisfy power requirements for that portable packet station you have been wanting to build.

In a series of articles in *CTM* magazine (Jan., Feb., and March 1987), Robert Hoover KA6HZF presented a conversion of the C-64 for both AC and DC. His conversion required quite a bit of work, including rewiring, and adding a switch jack. Since I am just interested in the portability of the C-64, I modified his conversion to fit my needs. My modification only requires desoldering a few parts and minor rewiring of the power section.

Photo A. K6YDW's arrangement of the great pair—they do the job.

Taking It All Apart

To convert the C-64, you must first disassemble it. This is easy, but you must take time to ensure that you don't lose any parts, such as screws, and that you don't damage the case during reassembly.

Place a towel or piece of cardboard on your work surface, then put the C-64 keyboard down on the pad with the front of the computer towards you. Three Phillips head screws hold the case together; remove the screws and turn the keyboard back upright. Lift the front of the keyboard up, and lift off the top section. To your left, you will see the cable for the keyboard. Unplug it, and also unplug the cable for the power-on LED. Set the top section aside until reassembly.

Once you have the top cover off, you will notice either a metal or cardboard RFI shield. If the shield is metal, you have one of the older models. The newer versions use cardboard. Remove the five Phillips screws holding the shield down. Put the shield aside.

Now you can remove the circuit board from the case. To determine which version of the C-64 you have, look at Figures 1 and 2, the parts (partial) layouts of the board. The only changes you have to contend with are L5 and R100, as the others are basically in the same locations. To remove the bottom RFI shield, desolder the tabs holding the shield to the circuit board, and set it aside. Now you're ready to do the conversion.

Converting the C-64

The only components we are going to work with are L5, CR4, VR1, R37 and R100. Conveniently, the parts numbers are etched onto the board for easy identification. Locating CR4, take a marking pen and place a "dot" where the positive hole is, then desolder CR4 from the board. Next, locate VR1, desolder the pins, and remove it. The "input" pin hole is the one next to the large heat sink, or to the right of the three holes.

L5 can be in either of two different locations, depending on which version you have. On the older version, desolder the right-hand leg and lift; on the newer version, desolder the top leg and lift.

Take a look at the schematic in Figure 4. This is where we will inject a 60 Hz clock signal into the circuit. Locate the R37 and R100 pads, and the resistance will be zero, since they are common.

To rewire the board for DC conversion, which requires only three wires, take a look at Figure 5. Input from P1 (power supply) is +12V, +5V and ground. For +12V, take a wire from P1 to the positive (+) pin on CR4 that you had previously marked, and then to the pin hole of the vacant VR1 location. For +5V, take a wire from P1 to the pin hole of L5 that you had raised. Next, run a wire for ground to the ground bus of the circuit board. Drill a ¼" hole between the two game port sockets, to run your power cable through. Now, set your board aside until the next phase.

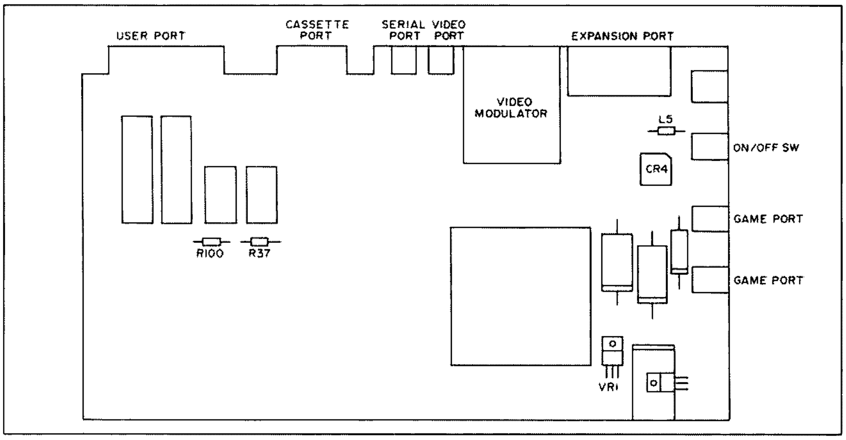


Figure 1. Old style board. The RFI shield is made of metal.

60 Hz Clock Circuit

A 60 Hz clock is required for this conversion

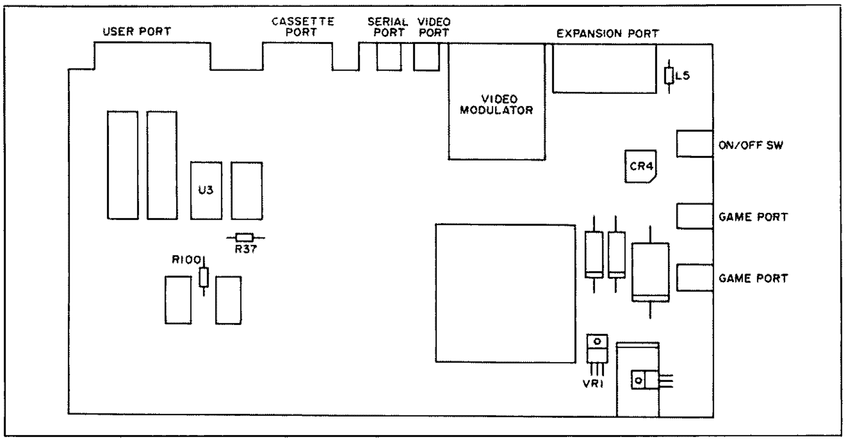


Figure 2. New style board. Notice that L5 and R100 are positioned differently. The RFI shield is made of cardboard.

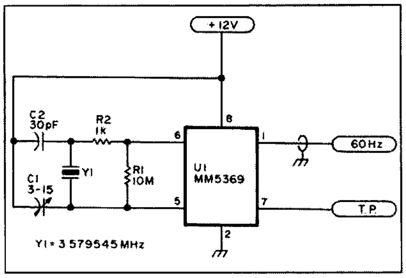


Figure 3. This 60 Hz clock drives the keyboard interrupts and other associated circuits within the computer.

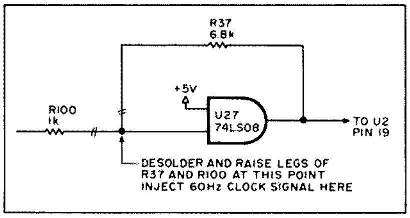


Figure 4. This circuit shows where you will inject a 60 Hz signal. A 60 Hz clock is required since you have disabled the 9 VAC line supplying the original AC power.

since you have disabled the 9 VAC line supplying the original AC power. This 60 Hz clock drives the keyboard interrupts and other circuits in the computer. See Figure 3, the schematic for a simple 60 Hz clock. Parts are available from JAMECO and others, or you can purchase a kit from Ramsey Electronics. See Table 1. I purchased my clocks from Ramsey (TB-6) for $5.50 each. They're small enough to fit inside the computer.

The schematic in Figure 3, from Mr. Hoover's article, is basically the same as the Ramsey version. After the clock module is assembled, place +12 volts on the circuit, take a frequency counter (at least seven digits), and attach it to the test point (TP). Adjust C1 to read 3.579545 MHz on the counter. This is all the adjustment required.

Use small coaxial cable (RG-174/U) from the clock module to the pin vacated by R37. To complete the rewiring, solder the +12 volt line to the new +12 volt line at CR4, and solder the ground wire from the module to the ground bus on the computer. To mount the clock module to the board, take a piece of "double-sided foam tape" and place the module behind the two serial ports, next to the video modulator. This phase completed, it's time to reassemble the computer.

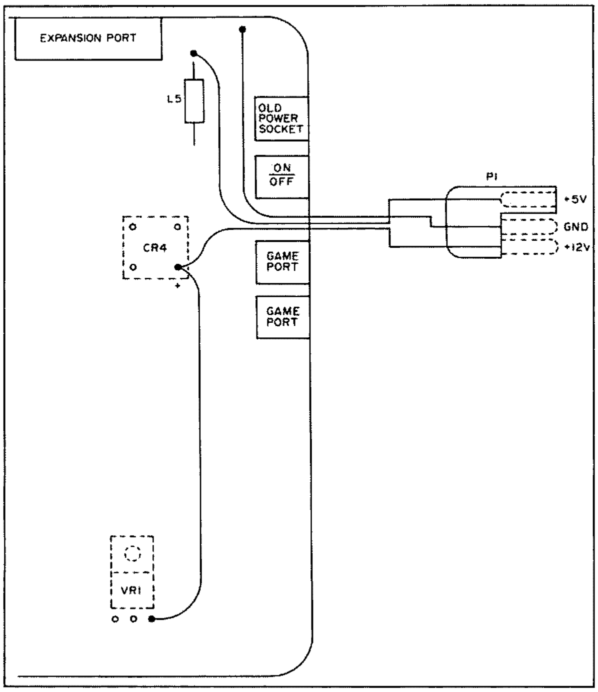


Figure 5. Rewiring the C-64 for DC conversion requires only three wires.

Reinstallation of the Board

To reinstall the lower RFI shield, use a soldering iron to re-flow the solder tabs where they're attached to the computer board. To reinstall the upper RFI shield, reverse the disassembling process. If you have any problem with the new clock module, you can cut the upper shield to fit.

Take the bottom half of the computer and place the circuit board back in, using the Phillips screws previously removed. Reattach the keyboard cable/plug into the socket and replace the keyboard top onto the bottom section using the three Phillips screws. This completes the reassembly of the computer.

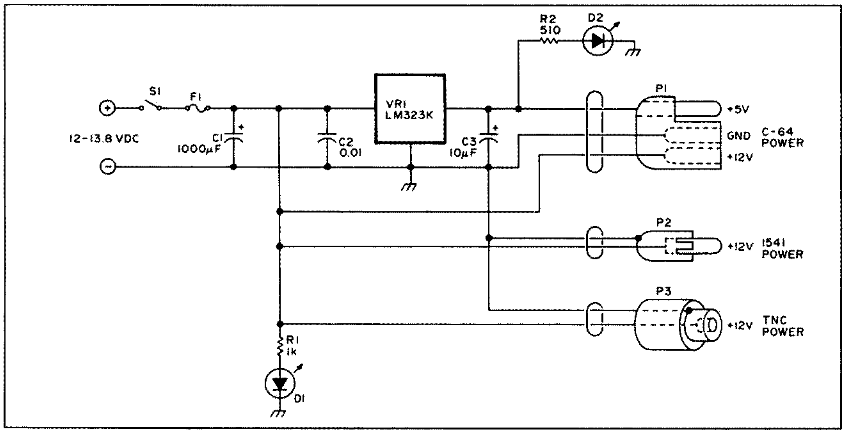


Figure 6. The modified C-64 requires both +12 and +5 volts. This simple power supply works for both the C-64 and the 1541 disk drive.

The Power Supply

The now modified C-64 requires both +12 and +5 volts. Figure 6 shows a simple power supply for both the C-64 and the 1541 disk drive. It also gives an output for your TNC. The C-64 requires approximately 1.3 amps at 5 volts, so you need a 5-volt, 3-amp regulator (LM323K). You can also use a LM309K or 7805K, but they tend to get somewhat warm, as they are rated at 1.5 amps maximum. Be sure to heat-sink this device with at least 12 square inches of heat-sink material.

Input to the power supply is from a DC source, which can be from 12 to 13.8 VDC. The circuit is very basic, so I won't go into great detail here as to its workings. Since different people prefer different plugs, I will leave that up to you. For the multi-voltage plug to the computer, I used a 4-pin Molex plug/connector; for the

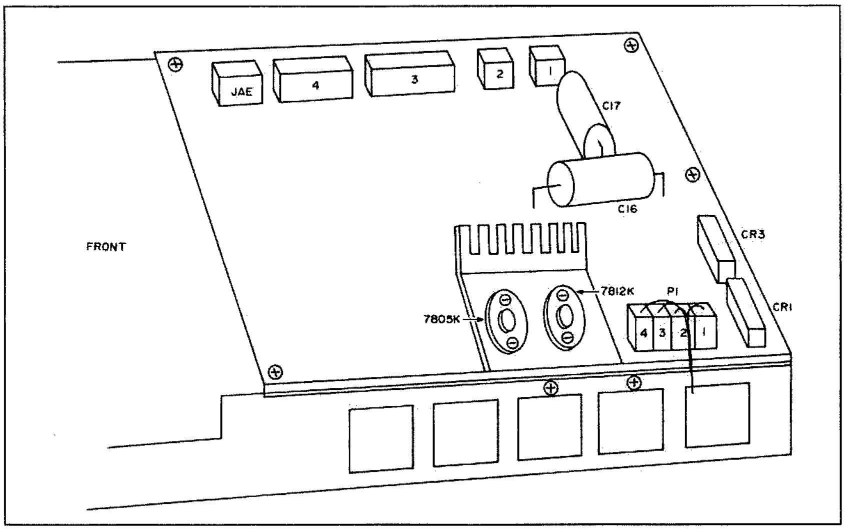


Figure 7. 1541 circuit board layout (partial). You'll remove C16, C17, CR1, CR3, the 7812K, and the AC power socket. You'll keep the 7805K, fuse holder, and power switch.

1541 disk drive, an RCA plug; and for the TNC, I used a 2.5mm coaxial plug.

1541 Disk Drive Conversion

Since my plans called for 12-volt operations only, I decided to do away with the AC supply components, which included the heavy power transformer. Just removing the power transformer lessens the weight by about 5 pounds, which is what you want if the complete system is to be portable. This conversion requires some desoldering and parts removal, along with some power circuit rewiring, a simple task which takes only a few hours.

First, remove the top cover. Use the same pad you used for the C-64 modification. Turn the drive over and remove the four Phillips screws, one on each corner. Remove the top cover and lay it aside until you're finished.

With the top cover off and the front of the drive to your left, take a look at the circuit board layout. Figure 7 shows the parts you'll work with. You need to remove C16, C17, CR1, CR3, 7812K, and the AC power socket. You will keep the 7805K, fuse holder, and power switch.

Remove the two screws on the left side of the chassis, and lift off the metal shield. With the shield removed, you can see the six connectors on the board, five along with the left-hand side and the power connector P1 on the right. Take a marking pen and mark each one with a number, as shown in Figure 7. The power connector (P1) doesn't require a number.

Remove the connectors and lay them out of the way. Take a Phillips screwdriver and remove the seven screws that hold the circuit board to the metal mounting chassis. (Don't forget the two screws on the right side, where the heat sink is attached.) Carefully lift off the circuit board and set the bottom section of the drive to the side, as we will get to it shortly.

Now that the circuit board has been removed from the chassis, we want to desolder and remove C16, C17, CR1, CR3 and the 7812K. Do this now, making sure you have cleaned out the pin holes left behind in desoldering. Once the 7812K has been removed, replace the two mounting screws back onto the heat sink, then place a wire jumper between the two pinholes (see Figure 8).

On the right-hand side of each bridge rectifier, CR1 and CR3, you will notice a plus (+) sign. Place a short wire jumper between the plus (+) pin and the next pin to the left. The modification to the circuit board is now complete.

The next phase of the modification is to remove the AC power socket and replace it with an RCA socket. First you have to remove the disk drive from the lower section of the cover. Look along each edge and you will see three screws per side. Remove these screws and lift the drive out from the bottom cover. The AC socket is held in by two small screws. Remove them and cut the leads on the socket from the transformer and fuse block.

Four leads go from the transformer to the circuit board, or P1 connector. My wires were blue and orange. Cut off the four leads at about 3″ from the connector (P1).

Turn the heavy power transformer on its side, and with a large Phillips screwdriver remove the four bolts holding it to the metal frame. In the space left after the removal of the power socket, get a small piece of aluminum and cut it to fit. Drill a ¼″ hole in the center for the RCA jack, and two holes for mounting the new bracket to the chassis.

To wire up the new power jack, fuse block, and switch, refer to Figure 8. On connector P1, only two of the wires are required, which means that two of the wires can be cut off flush with the connector. Leave pins 1 and 3 long, and make a "Y" splice with one leg going to the switch. Be sure to insulate the splice with heat-shrink tubing. This completes this phase of the modification.

Now, reinstall the disk drive into the lower cover using the six screws you removed earlier, then reinstall the circuit board onto the disk drive frame using the seven screws. After you have the circuit board mounted, go ahead and reconnect the six plugs. Check your wiring as you reinstall the circuit board and compare it with Figure 8.

Testing the 1541

Once you have convinced yourself that you have it wired up correctly, plug a cable (that goes to +12 volts) into the RCA jack on the rear of the drive. Turn on the power switch. If you hear loud noises, smoke, head chatter or see an LED blinking RED on the front of the drive, you have wired the circuit up incorrectly (i.e., the +12 volt lead to the +5 volt bus).

If everything checks out, turn the power off and plug in the serial cable from the C-64 to the drive. Turn on the C-64, then turn on the drive. Insert the 1541 test disk that came with the drive into the drive slot and do some diagnostic testing, along with formatting some disks and doing read/write sequences. If everything checks out OK, it's time to reinstall the metal shield and top cover. You've finished the project!

A Great Pair

I've made three conversions to both the C-64 and 1541 using the modifications in this article, and as yet I have not had one problem. The conversion is simple and straightforward, and also cheap to do. Total cost of parts for both the C-64 and 1541 conversion is no more than $15.

The C-64 and 1541 make a great pair for portable packet, even though they don't have the extras of the more expensive portable computers. They do the job, and they are available at a reasonable price. 73

Contact John D. Neeley K6YDW at P.O. Box 6672, Tahoe City CA 95730.

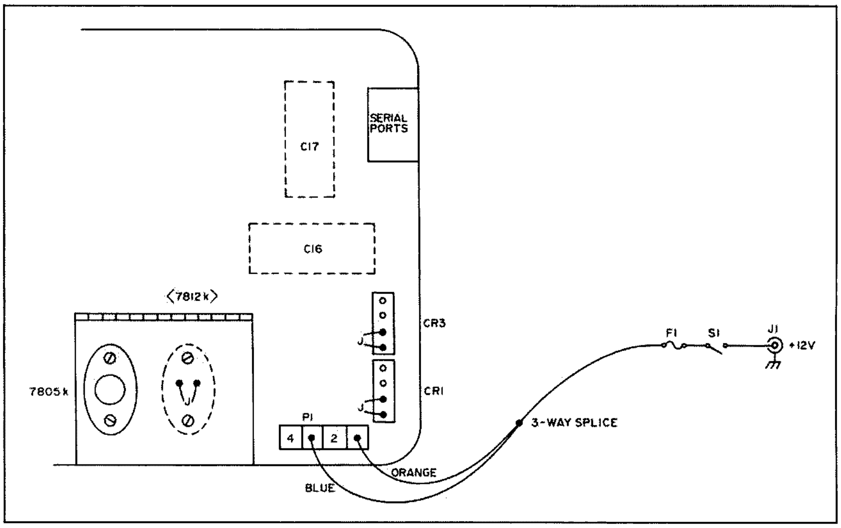


Figure 8. Time to wire up the new power jack, fuse block, and switch of the 1541 disk drive.

A Return to Kit Building

A first step in helping American students rediscover ham radio.

by Dan F. Onley K4ZRA

We've got to put the FUN back into ham radio. Individual kids, and classrooms full of them, need to become involved with hands-on electronics learning and building.

Kit building used to be basic to the learning and the fun of amateur radio. Given the median age today of U.S. amateurs, it's fair to say that too many of us remember all those kits from Knight, Johnson, WRL, Olson, Eico, Ameco and others, the hundreds of Heath ham kits in all price ranges, and the many kits from the earlier years of Radio Shack's history. We LEARNED from building those kits, whether it was our first regenerative receiver, that $30-50 Novice transmitter, or our first piece of test equipment or station convenience.

Today's amateur kit situation is drastically different. The Heath lineup is high in quality but lean in variety. Most other kit sources are part of that entrepreneurial infrastructure that many see as the main hope for a resurgence of the U.S. electronics industry. Typically, kit designs are quite good, but documentation is often little more than some simple notes or photocopies of magazine articles. And the rising cost of specialized components suitable for ham designs makes it difficult for vendors to make these kits real bargains.

Rather than philosophize on the reasons for the demise of U.S. amateur radio kit building, I'd like to tell you more about a well established U.S. domestic electronics manufacturer who is serious about making a difference in the amateur radio, hobby, and school club kit building scene.

Ramsey Electronics, Inc., of greater Rochester, New York, a regular *73* advertiser and frequent hamfest exhibitor, has grown to be a major international contender in professional VHF service equipment. Their fast-selling COM-3 Service Monitor graced *73*'s front cover in August 1989.

Too often, a company that hits the big time will drop amateur or hobby products in order to maximize the profitability of new ventures and markets. The boom and bust cycles of CB and satellite TV took their toll of yesteryear's big names in ham products. Not so at Ramsey Electronics. The ham community is fortunate that the CEO at Ramsey happens to be Mr. John Ramsey himself, N2HWA/VP5JR.

For 1990 Ramsey Electronics has committed to completely revamping its line of inexpensive kits for hams, students and hobbyists, including complete step-by-step assembly manuals with well printed X-ray views of PC board layouts and detailed suggestions for enjoying—and even adapting—each kit. Whenever feasible, the assembly instructions follow the new Ramsey kit LEARN AS YOU BUILD construction philosophy. For example, the parts installation sequence for simple receivers begins at the antenna connector and follows the signal path of the schematic diagram through each stage to the audio output. Transmitter projects make sure you have the oscillator tested and running before proceeding to the buffer and further circuitry. And so on.

You have a right to know of my vested interest in all this—I am the author, and my company is the publisher, of all the new Ramsey kit documentation. We work to ensure that every single manual is written to help newcomers without needlessly offending the intelligence of experienced amateurs. I have had to build, test, use, and fully understand each kit several times in order to design each manual to be as helpful as possible. Moreover, a detailed proofreading protocol has been set up between Ramsey Electronics and my publishing company. Therefore, I believe you can look forward to building Ramsey kits of all kinds with full confidence that you're getting a good deal, that it will WORK, and that you'll learn something from the experience.

Reviewing Some Reviews

In the context of these new developments, recent reviews and articles in *73* on Ramsey products deserve a brief "review" themselves.

The SR-1 AM shortwave receiver review by WA8PYH in the August 1989 issue included a suggestion that the SR-1 could benefit from an LM386 audio stage, rather than the LM358 used in the version built by the reviewer. The current SR-1 indeed uses the LM386.

In December 1989 WBØE wrote that it would be nice if the QRP-40 transmitter were supplied with a 7.040 MHz crystal for the international QRP calling frequency, instead of the 7.150 MHz crystal that came with his kit. In fact, all Ramsey VXO transmitter crystals had already been changed to recommended QRP frequencies two months before the article appeared.

This shows that Ramsey responds to reasonable improvement suggestions. And that certainly has been my own experience in preparing the new manuals. When I found myself agreeing with WA8PYH that a BFO would make the SR-1 superhet a more interesting and useful receiver, Ramsey FAXed me the approval for a BFO in future kits, and the approval to make modification information and parts kits available to present owners.

In March 1990 N8KDD offered an article on modifying the HR-4 Direct Conversion 40 meter receiver. While the article was somewhat mistaken in its premise that some fix is needed for comfortable 40 meter operation, the author's general suggestions on varactor tuning demonstrate how easy and inexpensive it is to use a basic Ramsey PC board kit as a foundation for a fascinating variety of customized homebrew projects. N8KDD also wrote a helpful article for December 1989 on building an economical 40 watt HT-to-mobile conversion for 2 meters, designed around Ramsey's $27.50 PA-1 amplifier kit.

WBØE's review of a Ramsey QRP transmitter happily told of a confirmed QSO with a nearby western state. I'm happier yet to tell you of DOZENS of DX QSOs I've made with the QRP-30 (new) and QRP-20 transmitters, using dipoles discretely hung in the balcony of our condo unit! If you've been intrigued by Mike Bryce's regular QRP column in *73*, I think you'll find Ramsey transmitters and direct conversion receivers to be convenient and fun building blocks for setting up economical QRP stations. The spacious circuit boards give you room for modifications and improvements.

Kit Building: Bringing Back the Skills of Ham Radio

Ramsey wants you to be happy with their kit products. That's why they contracted with us to provide the best instruction books possible for inexpensive kits. They want you to be happy with past kits, too, which is why they've always had a cheerful money-back guarantee on their products.

What they **DON'T** want is to sell you factory service on a $5–35 kit! That's why both the old instruction sheets and the new manuals nag the builder relentlessly about making good solder joints. Ramsey and other equipment makers sing in unison that over 95% of all factory service involves correcting bad solder joints in kits or customer-modified gear. The 25 years on my Extra ticket served as no guarantee of state-of-the-art soldering skill, but after building, testing, and explaining in plain English scores of Ramsey PC boards, I think I'm re-earning that ticket!

Proper PC board soldering skill needn't be unique to factory workers or robots. It should be as fundamental to all hams as good CW/SSB/repeater operating practices and should be taught patiently to kids and other newcomers. Then we can begin to develop real alternatives to the $900 imported transceivers now being called "entry level" rigs—a real concern if we are serious about showing our hobby/service to young people (whose parents and siblings have their own thoughts about what to do with the family's discretionary dollars).

Imaginative, affordable kits are a vital part of the answer, both to the future of the U.S. electronics industry, and to the appeal of amateur radio to young people and folks who really have to struggle to make a living. I foresee a revival in ham radio kit building, with Ramsey's initiatives leading the way.

In sharing my enthusiasm for the Ramsey Electronics "Kit Revitalization" project, I encourage every kit vendor to give more careful attention to documentation. I'm sure we'd all like to see new Heathkits developed for hams, but I suspect that Heath would first like to see a livelier market to justify such development. I'd like to see radio equipment dealers show more respect for Heathkit equipment as trade-ins, but I'll bet they would first need to see good soldering become the norm, rather than the exception, among hams.

In any case, I'm convinced that Ramsey's fresh commitment to economical, well documented kits is very good news for amateur radio in the 1990s. I think it's encouraging that there's an accessible national source for $5 amplifier or oscillator kits, and a nice variety of functional station gear in the $25 class, from HF receivers and VXO QRP transmitters to VHF FM receivers, HF transceivers, CMOS keyer, Active Antenna, and 40 watt VHF Amplifier—plus some new surprises I'm not supposed to mention yet.

Uncle Wayne wants us to work at putting some fun back into our hobby. I'm having more fun already, now that I know I could run back to a dealer and convert my Yaesu and Kenwood gear to cash, make a deal with a collector for my treasured 1937 HRO and 1948 Collins exciter, use the proceeds to cope with realities like skyrocketing health insurance costs for small businesses . . . and still enjoy ham radio with a few dollars' worth of Ramsey kit radios. 73

Dan F. Onley K4ZRA is President of Pastoral Arts Associates of North America (PAA), which has a new school-electronics division, Discovery Resources for Radio Communication (DRRC). Licensed in 1958, he earned his Extra Class and Commercial licenses at age 19, founded several school ham clubs, and gives full credit for his teenage enjoyment of ham radio to the Elmers of his hometown of Owensboro, Kentucky, including ARRL VP George S. Wilson III W4OYI. You may contact him regarding this article and for reasonable assistance with Ramsey Electronics kit projects at 642 North Grandview Avenue, Daytona Beach FL 32118.

73 Review

by Joe Holman KA7LDN

ICOM CT-16 Satellite Interface Unit

An easy way to change VFOs.

ICOM America, Inc.
2380 116th Avenue N.E.
Bellevue WA 98004
(206) 454-7619
Price Class: $100

The ICOM CT-16 Satellite Interface Unit makes changing your uplink and downlink VFO frequencies as easy as changing a single VFO frequency. One of the most common complaints heard today among satellite operators is: "I am always playing catch-up with my uplink and downlink frequencies—I wish I could free my hands up more!" Well, you can now forget about this annoying and painful task.

The CT-16 is a small black interface unit that allows two of your ICOM x75 series rigs to communicate with each other. When enabled, the CT-16 lets you simultaneously change two separate VFO's frequencies (on the two different rigs) via one of the selected single tuning knobs on your rig. The CT-16 interface unit works well with any ICOM rig using the ICOM CI-V communication system. (All ICOM x75 series rigs use this type of communication system, except for the IC-735.)

How It Works

The CT-16 Satellite Interface Unit bidirectionally sends (serially) two ICOM x75 rigs packets of information via the interface unit. The ICOM CI-V (Communication Interface - V) System uses the CSMA/CD (Carrier Sense Multiple Access with Collision Detection) standard.

A packet of information contains two main types of data, plus some other codes. The first main type of data is a unique number or "address" pertaining to a particular ICOM rig such as 16 for the IC-275 and 20 for the IC-475. The second main type of data contained in the information packet is a command which tells a particular rig what task to perform. The standard format of an information packet is as follows:

preamble preamble RX address TX address command frequency end of message code

Each section is one byte in length. The

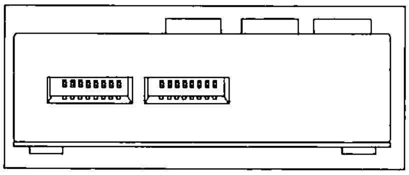


Figure 2. Address switch locations, front view.

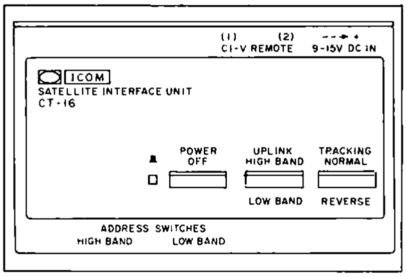


Figure 1. Ct-16 interface unit, top view.

"preamble" tells the microprocessors that a command is arriving. The "RX address" is the rig/CT-16 address which is sending the packet of information. This is needed so that an acknowledgment can be detected with the same address in the TX address byte. The "TX address" denotes which rig is supposed to receive and process the command. Since both rigs receive all commands, commands received by the "wrong" rig can be ignored. The "command" is which command is to be executed. The "frequency" is the frequency to be set, or returned from an interrogating command. The "end of message code" tells the microprocessor that the complete packet of information has been completely sent.

The following types of CI-V commands are available:

- set frequency
- mode set
- band edge read
- frequency read
- mode read
- frequency set
- VFO set
- memory channel set
- memory channel read
- memory channel write to VFO
- memory channel clear
- scan start or stop
- split operation

All information packets can be sent at either 300, 1200 (default), or 9600 baud.

Remember, a particular rig can only process a frequency command when its internally stored address matches the address received in an information packet. All other packets are quickly discarded by the rig's microcomputer. All addresses are factory prearranged/assigned, and will never be the same for two different rigs.

Pre-Operation

Before depressing the power switch, which enables the interface unit, you need to set the address switches properly according to which rigs are to be controlled, select the uplink switch position, and select the tracking. (See Figure 1 for a top view of the interface unit, and Figure 2 for a front view of the interface unit's address switches.) Remember: Once depressed, the power switch enables the unit so you must make all pre-adjustments prior to switching the power on.

The address switches tell the interface unit what rigs are connected. If you select the wrong address for the right rig, the rig will not respond to any command that is sent to it. Unfortunately, the interface unit cannot notify you of this mistake, and all your efforts will soon fail when the power is turned on.

When trying out the interface unit, I connected the IC-275A and IC-475A rigs to it, setting the address switches as shown in Figure 3. The uplink switch selects which rig will be the "master" rig (usually the uplink), and which is the "slave" rig. When the interface is enabled, the master can change the slave's frequency hertz for hertz as you turn the VFO frequency dial on the master. For example, if you change the master's frequency by 5 kHz, the slave's frequency will also change by 5 kHz. Note, however, that when the uplink switch is in the high band position, the interface unit assigns the rig which operates in the higher frequency range to be the master controller. When the switch is in the low band position, the interface unit assigns the lower operable frequency rig to be the master.

But, was that previous change in frequency +5 kHz or −5 kHz? To answer that question you must examine the tracking switch. If the tracking switch is in the normal position, the

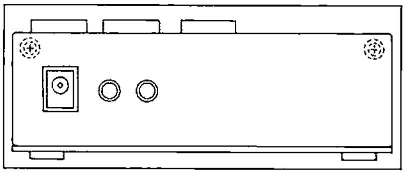


Figure 3. CT-16 (rear view).

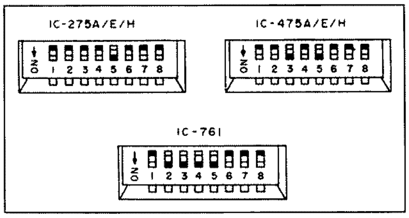


Figure 4. Transceiver address settings.

SATELLITE STATION		UPLINK FREQUENCY	DOWNLINK FREQUENCY	UPLINK SWITCH	TRACKING SWITCH
	B MODE	435 MHz	145 MHz	OUT	IN
AO-13	J MODE	145 MHz	435 MHz	IN	IN
	L MODE	1296 MHz	435 MHz	OUT	IN
RS-10	A MODE	145 MHz	29 MHz	OUT	OUT

Figure 5. Satellite frequency chart/tracking switch.

interface unit coordinates the slave to change its frequencies in the same direction as the master does (up 5 kHz on the master, up 5 kHz on the slave, and vice versa). However, if the tracking switch is in the reverse position, the interface unit changes the slave's frequency in the opposite direction than that of the master (up 5 kHz on the master, down 5 kHz on the slave).

The tracking switch is a very important switch on the interface unit. You will want to have it in the reverse position if the transponder you are working inverts its signals, such as for all of OSCAR 13's transponders. However, if you are working a satellite which does not invert its transponder signals, such as RS-10 in Mode A, you will want the tracking switch in the normal position—noninverting. Figure 4 presents some example tracking switch settings for some common satellite modes.

Tuning In (Standard Operation)

Just before switching the CT-16's power on, adjust your uplink and downlink frequencies—because, once you turn the power on, you are off and running! For proper operation, you will need to set your uplink and downlink frequencies at the upper and/or lower satellite range limits, depending upon the satellite's transponder.

If the transponder inverts signals, set the downlink frequency to the transponder's lower edge, and the uplink frequency to the transponder's upper edge. For example, on OSCAR 13 Mode B, I set the IC-275 to 145.825 MHz and the IC-475 to 435.570 MHz. Then I can switch the interface unit's power on and adjust frequencies by means of the master rig. As I turn the master rig's tuning knob counterclockwise, the IC-475's frequency decreases, and the IC-275's frequency increases! Pretty easy, and one of my hands is free!

However, if the satellite's transponder does not invert signals, set both your downlink and uplink frequencies to the transponder's lower band edge limit. On RS-10 Mode A, this means setting one rig to 145.860 and the other to 29.360. Then, switch the interface unit's power on. Now when enabled, as you increase the master's frequency by turning the master's VFO knob clockwise, the slave's frequency increases, and vice-versa for the other direction.

Blink Blink Blink

One of the features of the CT-16 I especially like involves the power indicator. Normally, the power indicator shines brightly whenever the interface unit is supplied approximately 12 volts DC. However, if you ever tune to a particular downlink frequency that correlates to an out-of-band edge uplink frequency, the power indicator blinks on and off repeatedly until you move back to an in-band frequency.

This is a real handy feature in case you do not have a frequency chart right in your hand after tuning up for the initial time. If you set the satellite's band limits before turning the power on, you will not have to look up at the chart again to find a particular set of band limits because each time you go out of band the power indicator flashes, telling you that the current frequency is out of range.

Power Requirements

The CT-16 interface unit does not require much power but it must be connected to a power source which provides some clean power between 9 and 15 volts DC. Since the majority of the unit's components are digital it does not draw much current—the interface unit only requires approximately 25 mA. Just about any standard power supply provides these ratings. The interface unit comes with a nice DC IN jack that plugs directly into the back panel of the unit.

The Final Word

The CT-16 is a great little unit and I would recommend it to anybody owning a pair of ICOMs. After setting-up the CT-16 you can pay less attention to the annoying task of continually tweaking the frequencies of your satellite uplink and downlink rigs. You can have more fun—and that's what we are all here for, isn't it?

I only found one thing that I did not like about the CT-16: the number of communication ports available. Currently, the interface unit only supports two rigs to communicate to each other simultaneously. I think it would be a great idea to have more than two ports available and to have switches to interact with different sets of rigs.

And, ah yes, the infamous Doppler shift. The interface unit cannot automatically make up the difference for the satellite's Doppler shift affected signal. This means that you have to retune your master rig's frequency to compensate for Doppler shift.

Here's a note for amateurs using the previous ICOM CI-IV communication system (IC-751, IC-751A, IC-R71A/E/D, IC-271A/E/H, IC-471A/E/H, and IC-1271A/E). The CI-IV communication system can use the CT-16 by using an ICOM designed converter, the UX-14. ICOM offers the UX-14 CI-IV/CI-V converter for about $72.50 (suggested retail price). 73

73 Review

by Bill Clarke WA4BLC

AMERITRON Coax Switch

It makes band-hopping a snap!

AMERITRON
2375 Dorr St., Suite F
Toledo OH 43607
Tel. (419) 531-3024
Price Class: $135.

Recently, I made some major changes to my HF antenna system. As a result, I found I needed to purchase several hundred feet of new coax cable to make the run from my shack to my tower and beyond.

I checked the prices of new coax in the magazine ads and at a local supplier. Instantly, I became a victim of sticker-shock. I hadn't bought coax in several years, and I didn't realize how expensive the stuff had become. From the quoted prices, I assumed that most of it was stored at Ft. Knox with the other gold.

A Helpful Discovery

Then the AMERITRON RCS-4 Remote Coax Switch came to my rescue. By mounting the remotely controlled coax switch on my tower, I only needed a single HF feedline from the shack.

The RCS-4 is a four-position remotely controlled coax switch designed for HF use. It isn't rated for VHF/UHF use, however a conversion switch is available (RCS-8V). By operating on voltages superimposed on the coax feedline, it requires no, repeat NO, separate control cables. Controlling is done from a small console box in the station.

The RCS-4 comes in two parts: a remote relay box and a switch console. The remote relay box is designed to be tower-mounted, or at least mounted outside. It has five SO-239 connectors on it so that you can connect it to four antennas and the coax feedline.

The switch console contains an AC power supply, ON/OFF switch, and a four-position rotary control that you turn to select the antenna you wish to use. LEDs indicate the selection.

A Look Inside

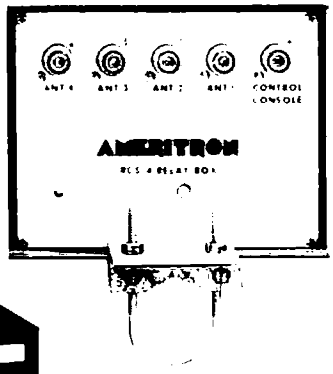
Before mounting the remote relay box, I opened it up to see what it was built of. The box consists of a metal plate with mounting hardware and a heavy plastic cover. The cover-to-plate joint is sealed to keep water out. The internal circuit components are all mounted on a fiberglass PCB. The relays are multiple contact and the contact points appear hefty enough for all legal HF power limits. Soldering was neat and clean.

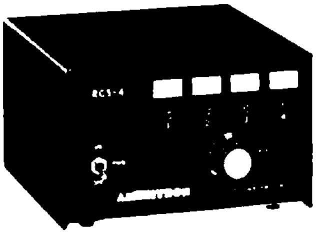
Because I had broken the weatherproof seal, I applied my magic sealing compound to all joint surfaces necessary to ensure watertightness. Then I reassembled the unit.

The console box houses the AC power supply, switches, and the means for placing control voltages on the feedline. The steel box is heavy enough so that it doesn't slide around on the desk. Neutral in style and color, it fit well into the scheme of things on my desk. The metal case provides 100% shielding to help prevent RFI.

Operating with the RCS-4

My antenna system consists of a full-size 75 meter loop, a half-wave vertical for 10 meters, a tribander for 10/15/20 meters, and one experimental line that always has some new concoction hanging on it. That makes a total of four feedlines, just what the RCS-4 can handle.





The switch makes the antenna changes for me, just as I desire, and it works flawlessly. There are pencil pads (places to write) on the front of the control box for labeling each switch position.

Saves Money and Time

Would I recommend the RCS-4 Remote Coax Switch to my friends? Yes, I would. The RCS-4 does its job as advertised, and by eliminating three extra feedlines, each with two coax connectors, you save money and time. It saves you money because you have to buy less coax; it saves you time because you don't have to install the coax connectors. Additionally, having only a single HF feedline cuts down on the number of holes you have to drill through the wall of your shack.

The RCS-4 is a snap to install. No extra control lines! All control voltages are superimposed on the feedline. My installation time was 30 minutes, including climbing time and sealing outdoor coax connections. A note: To use the RCS-4, you need a short patch cable from your station's output (transceiver, amplifier, tuner, or whatever) to the switch console.

The switch console makes band-hopping a snap, and the rotary selector knob turns very easily, unlike a manual coax switch. In the OFF position, the number four relay position switches to ON. I use this position as a default for my favorite antenna.

True feedline grounding is not available on the RCS-4 unless you want to use the number four position as a ground. This is not a drawback to me as I have other means of switching to ground and disconnecting my antenna system.

I could find no degradation of signals when using the RCS-4. No clicks, hums, or buzzes were heard that might be caused by the superimposed control voltages.

Though I destroyed the waterproofing when I opened up the remote relay box, I wasn't really satisfied with the original weatherproofing job anyway. I resealed it with The Welder, a product from New York Bronze Powder Co., Inc., which is available at K-Mart and most hardware stores. I also used same to seal around each SO-239. I don't like antenna system maintenance; I want things to last for years. ■

Specifications of the RCS-4

Antenna positions:	4
Loss at 30 MHz:	< 0.05 dB
VSWR:	< 1.1:1 from 1.8–30 MHz
Impedance:	50 ohms
Power limit:	1.5 kW average 2.5 kW PEP max.
Switching time:	50 ms
Power requirements:	120 VAC 50/60 Hz 220 & 440 VAC optional
Connectors:	SO-239

Bill Clarke WA4BLC can be reached at Box 2403, Falls Church VA 22042. Bill enjoys experimenting with new equipment, and he has written many reviews for *73*. He also writes books on aeronautics and aviation.

Hamfest Shopping

The Murphy Method.

by Stu Stephens K8SJ

As a veteran hamfest dealer and shopper I have read with interest recent articles about purchasing used gear: an account of how to take another ham to Small Claims Court, and a detailed list of testing procedures for suspect gear. I offer a third alternative: The Murphy Method of Hamfest Shopping. This is a correlation of Murphy's Law ("A thing that can possibly go wrong, will.") simply stated: "All gear offered at a hamfest either doesn't work or doesn't work very well." The Murphy method is: The final sales price should take into account the cost of repair.

The Case Studies

Case Study One: the Hamburg (New York) Hamfest, ten years ago. Late the night before the hamfest, I pulled up and parked my wagon-trailer combo by a large, rollicking RV. The friendly guys invited me in for a round of brew and conversation. Part of their wares was a recent-vintage linear. Seems that at a sudden stop on the Interstate the linear, stored unsecured on a top shelf, had done a two-and-a-half-gainer dive onto the floor, an eight-foot drop. The next morning, to the question, "Does it work?", I heard the truthful reply, "Sure, the last time I plugged it in..."

Case Study Two: a different hamfest. One bemused fellow told me how he was going to trade a transceiver for a vintage transmitter: "Of course it works!" When the offered rig seemed a little light, he unscrewed the cabinet for further inspection. The power transformer was gone.

Case Study Three: the Rochester (New York) Hamfest. In the quiet evening I talked with a tube merchant, trading secrets. "Do you check them?" "No, I simply don't have the time. I guarantee to replace them, but I don't check them." True to his word, if you return the tube, you will get another, also unchecked.

Beating Murphy

We hams have a choice of being mad or being smart. Being mad is expecting perfection from the stranger sitting behind the table, strewn with eight-track tapes, his wife's Styrofoam™ Christmas ornaments, and cabinets with suspicious waterlines six inches up. Being smart is joining in the spirit of the human adventure, expecting a foxhound bargaining ritual, and never parting with more coin than would prevent you from saying, "Even though it might not work, I can fix it," with a smile.

Photo A. W8DMR and W8RVH ponder a "real bargain."

To practice the Murphy Method, I offer the following guidelines:

1. Know in advance (even carry the list with you) the retail prices of used pieces of gear. The retail stores are different; most do check the gear and offer a limited guarantee. All offer facilities to light-up the rig before you buy. The retail price is the **top** price. You know you can get the piece, guaranteed, at this price—any hamfest price should be **significantly** lower.
2. Walk away (politely) from anyone who will not bargain. Anyone hamfesting should know and abide by the rules of the game. Dickering is not only the rule, it's what makes it fun. Assume that all hamfest prices are inflated to include room to come down.
3. Any piece of gear that comes with a manual or schematic is worth an extra look. You'll need them.
4. Be on the lookout for a spare-parts junk version of the unit you want. For a few dollars you'll have a grab bag of replacement pieces, especially the mechanical parts for which there may not be a substitute. Again, you'll need them.
5. Don't underestimate the two dollar, Day-Glo spray-painted bargain. My brother bought such a Globe Scout, replaced the filter capacitors and final tube, and it fired right up. Ugliest radio on the air.

Photo B. K9RKA and KA8LWR make a discovery.

6. Don't overestimate the two dollar, Day-Glo spray-painted bargain. I bought six Novice-style CW transmitters for $40. While all of them passed the smoke test, not one of them puts out a signal.
7. On the really major purchases—the rig that will become the centerpiece of your hobby—think seriously about both your pocketbook and your frustration level. Sometimes, the mint, working bargains do come down the road. Sometimes, we need to spend the extra dollars for retail used or new gear, to get exactly what we want. Generally, we get what we pay for. Figure your enjoyment and frustration levels into the price of a radio, and shop accordingly.
8. For the more expensive, specific-interest purchases, shop the classified ads of the radio magazines and sales sheets. You'll pay a bit more, but you'll have the advantage of a name, phone number, and address. The flip side is also advisable: If you need a higher dollar for a piece of gear, don't hamfest it, but sell it through an ad.

You'll find me at Dayton every year, the guy with the plywood tables that tip if you lean on them. If you ask, "Does it work?", I will truthfully reply, "I don't know" **and**, "I have priced it accordingly." If you bargain accordingly you will have fun, pick up some nifty bargains, and lower your blood pressure by practicing the Murphy Method of Hamfest Shopping.

Contact Stu Stephens K8SJ at 1407 Hollyrood Road, Sandusky OH 44870.

Turnstile Antennas

A budget antenna for HF–UHF

by John B. Dillon, M.D. KH6FMT

The turnstile is one of many useful antenna designs. I have used it as an omnidirectional antenna on 435 and 146 MHz for low-orbiting satellites. It's also good for the RS 10/11 satellites on the 10 and 15 meter bands, as well as for general use on those frequencies, and for local UHF and VHF operation. The best description on turnstile construction is in *The Satellite Experimenter's Handbook*, published by the ARRL in 1984. However, there is an error in Fig. 6-28 on page 6-21; the shields of the 50 and 92 ohm coaxes should be soldered at their point of contact.

CORIAN® by Dupont, used to line countertops and shower stalls, facilitates construction of the turnstile. It is expensive, but scraps are available. *[Ed. Note: Call 1-800-426-7426 to find your local CORIAN dealer.]* CORIAN is resistant to heat and very strong. You can saw, drill, or turn it. It is a totally satisfactory insulating material at all frequencies, at least through 435 MHz.

To make the disc, you can use a 2" hole cutter on CORIAN that is ¼" to 5/16" thick (see Figure 1). The center hole is for mounting the antenna on a ¼" wooden dowel. I used #10 house wire for the dipoles on 435 MHz and ⅛" brazing rod for 2 meters. I have not tried the antenna on 220 MHz, but it should work satisfactorily. These antennas require a reference ground plane. On 10 and 15 meters, I use dipoles mounted on the roof, drooping at 45 degrees, without any specific reference ground.

DXing with the Turnstile

When OSCAR 12 was available, I received

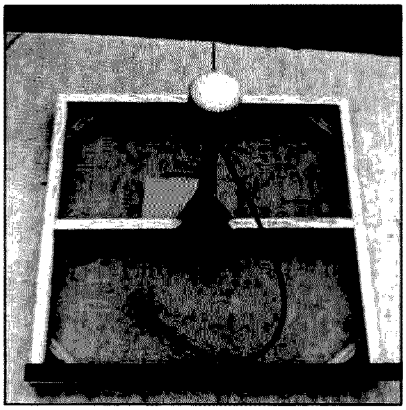


Photo A. 435 MHz turnstile antenna.

its beacon at the 1500 km maximum limit of acquisition as calculated on the Graftrak II program by my computer. On 10 and 15 meters I have worked both the US and Australia. The 10 meter unit would seem particularly attractive for the Novice. This works well with the new Microsats and should be an excellent choice for WEFAX reception on 137 Mhz. It has even been used to work through OSCAR 13.

These are not gain antennas, but my location here in Hawaii is ideal: thousands of miles from any large body of land, surrounded by salt water.

Cutting and Trimming the Coax

RG-62 (92 ohm impedance) is used as the quarter-wave delay line between the dipoles. Amateurs don't generally use this type of coax, but it is advertised by and available from most suppliers. Its velocity factor is 0.84. In Figure 2, you will find the lengths of RG-62 for the various frequencies. Trim the dipoles for best VSWR at the frequency of interest, although the antenna is moderately broadbanded. Cut the RG-62 for the center of each band. Calculate the lengths using the standard formula of 468/F(MHz).

The ground references on UHF and VHF are made with metal screening and chicken

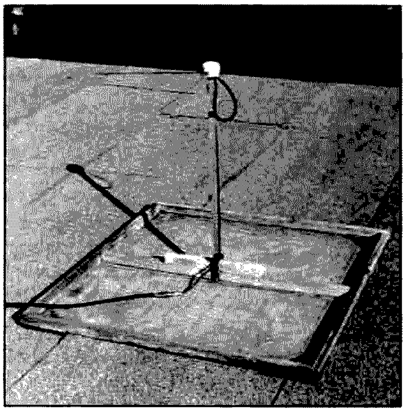


Photo B. Two meter turnstile antenna.

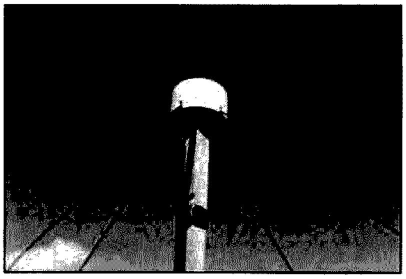


Photo C. Detail of the disc cover on the 10 meter unit.

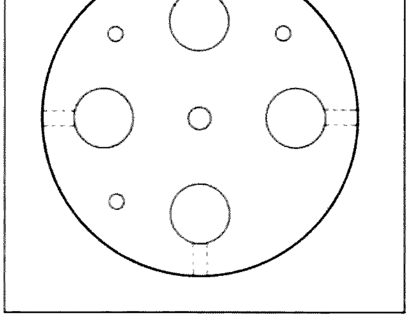


Figure 1. Hole pattern for the CORIAN mounting disc.

FREQUENCY	MATCHING SECTION	DIPOLE
435	5.4 INCHES	6.4 INCHES
220	10.72	12.76
146	16.1	19.25
28.5	82.76	98.5
21.5	109.7	130.6

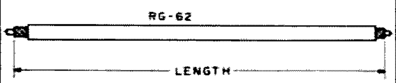


Figure 2. RG-62 matching section and dipole lengths for the various frequencies.

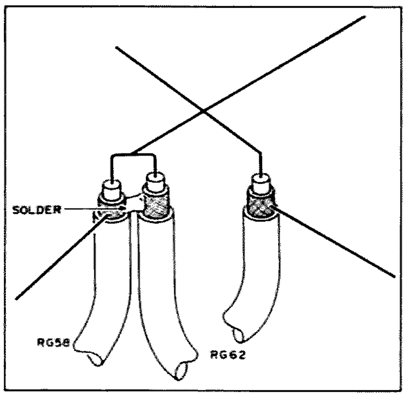


Figure 3. Feedline configuration of the turnstile.

wire. The 435 frame is 20" square and the 2 meter is 48 inches. Thirty-six inches would be fine for 220 MHz. Experimenting, I found the distance of the dipoles from the ground planes optimal at around 3/7 of a wavelength as recommended by K2UBC. A spacing of 13-¾" was optimum for 435 MHz and 35-½" worked best for 2 meters.

I used a length of RG-58 from the dipole junction to the main coax. Do not use foam type RG-58, as soldering this to the elements is very unsatisfactory.

Photo A shows the completed 435 unit. I used a PVC 2" cap over the disk for weather protection, and filled the holes with white liquid rubber. In a 2 meter antenna, the holes could be filled with epoxy cement for additional strength because of the longer dipoles. Using care, it is possible to get close to a 1:1 SWR with these units. However, to do this with a Bird meter at the junction of the RG-58 and the main line, you have to stand at least 10 feet from the UHF and VHF antennas to read the meter. Minimum SWR can be obtained with the VHF and UHF versions by slightly adjusting the element height above the ground plane. I use the meter in the shack on 10 and 15. A ground plane framework is not necessary for the 10 and 15 meter turnstiles. These dipoles are set with the 15 meter unit about four feet above the 10 meter unit on the same wooden mast, and rotated at 45 degrees. It looks somewhat like umbrella spokes or a discone.

You may contact John B. Dillon, M.D., KH6FMT, PO Box 759, Koloa HI 96756.

PK-232 Connect Memory

Lets you know what you missed.

by William Bleher W8GQL

The packet station here in my shack is a PK-232 with Pakratt software running on an IBM clone from a hard disk drive. I hate to leave the hard disk running continuously when I'm not in the shack (wears out the bearings, you know), so I set the MTO, MFROM and DFROM parameters to REJECT ALL and the CFROM to ACCEPT ALL. Then I turn off the computer when I leave so that the PK-232 2K buffer won't fill up with miscellaneous channel talk, but will allow anyone connecting to me to leave messages in the buffer. I also do this while I am using the computer for other tasks.

Upon returning to the shack or finishing the other task, I always wonder if anyone has connected while I was busy elsewhere. The PK-232 does have a red connect LED, but it only lights up during the actual connection. It goes off when the party disconnects. I have always thought it would be nice if the unit had a connect memory and indicator that would alert me to the fact that a connection had occurred while I was gone. That way, I wouldn't have to fire up the Pakratt program just to check it out.

The simple circuit in Figure 1 provides this feature. It consists of two cross-coupled open collector NAND gates configured as a flip-flop to provide the memory function, and a steering gate driving a bi-color (red-green) LED to provide a red indication for normal connects, which turns green after the station disconnects. The circuit is built on a small perfboard mounted on bus wire stilts from two unused pads (which happend to be +5V and ground) near U12 on the PK-232 display board. The other three connections are made directly to the CON and STA LED pads. The original red CON LED is removed and replaced with the bi-color LED (Radio Shack #276-012). Thus no hole drilling or defacing of the front panel is required.

Description of circuit operation starts with power up when the 0.001 µF capacitor at IC1-5 provides a power on reset for the flip-flop by delaying the rise of the STA signal, thus making IC1-6 high (and conversely IC1-3 low), assuring that the green LED will be off. At this point, both U18-6 and IC1-8 outputs are high, and the CON LED has +5V on both ends through the 220 and 330 ohm pull-up resistors. The green element, requiring more voltage than the red, uses a 220 ohm resistor.

After the Pakratt program is loaded and the MTO, MFROM, DFROM, and CFROM parameters are set, the computer is shut down or given another task. The PKT and CMD LEDs remain lit.

A connect will pull U18-6 low, turning on the red CON LED and setting the flip-flop output IC1-3 high. The steering gate output still remains high, however, since IC1-9 went low before IC1-10 went high. When the connecting party finishes his message and disconnects, U18-6 goes high, causing the red LED to go out, and enabling the steering gate, since both inputs IC1-9 and 10 are now high. IC1-8 then goes low, turning on the green LED via the 220 ohm resistor. It will stay on until a STA signal resets the flip-flop. This will occur when the Pakratt program is again activated and a normal or UNPROTO packet is sent. I generally hit RETURN after rebooting the program, thus sending out my UNPROTO "TEST" packet, which resets the flip-flop.

U18 (7406) and IC1 (7438) are both open collector units that have 40 mA current sink capabilities and can easily handle the double currents imposed on U18-6 and IC1-8 by the dual pull-up resistors

The bi-color LED is pale white when extinguished and an orange color, compared to the PK-232's red LEDs, when lit. This leaves something to be desired, but it's a joy to come home and see the green LED on among all the red LEDs. Reminds me of Christmas.

William Bleher W8GQL, 18678 Negaunee, Redford MI 48240.

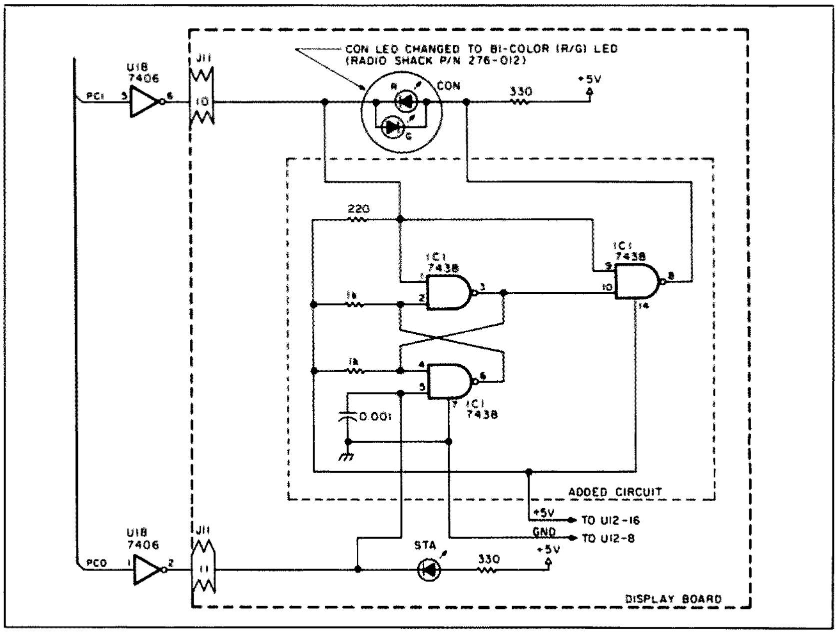


Figure 1. The PK-232 Connect Memory circuit lets you know that a connection occurred while you were gone.

Audio Patch Panel

A neat way to switch.

by David Manson N1CTI

If your shack is anything like mine, appearance is not its most redeeming value. Parts, books, magazines, and other miscellaneous objects, tend to collect on and around the operating position, attesting to the amount of time spent operating or building as opposed to cleaning.

A major cause of the cluttered appearance came to light during a recent visit to my shack by a local ham, K1GUP. He had come by for a quick demonstration of the latest and greatest RTTY program for the Radio Shack Color Computer. Incidentally, the program was from the "RTTY Loop" column of *73 Magazine*.

While trying out a newly built project, I tend to make just enough room for it somewhere on the operating table, connect it up to the rig, and put it on the air. Many of you probably do the same. It expedites testing, and besides, you'll get around to making it neat later, right?

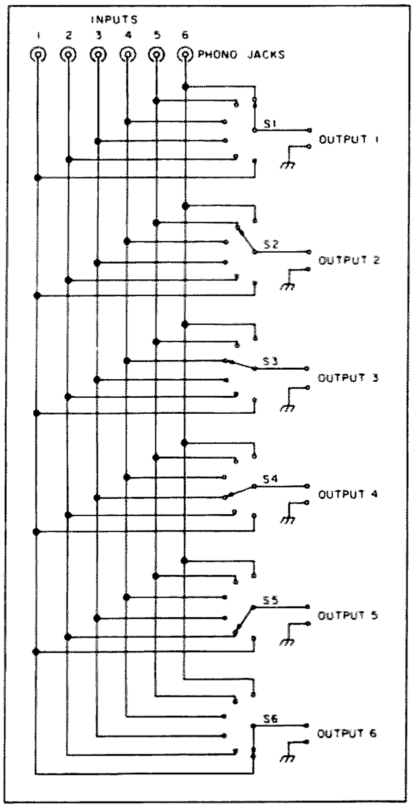


Figure 1. Schematic of the audio patch panel.

When Jerry K1GUP dropped by, I had been watching 20 meter SSTV, so I had to reconfigure the station for the RTTY demo. This simple-sounding task actually consisted of disconnecting two cables and reconnecting another two after fishing them out of their hiding places behind the rigs.

The Ideal Requirements

What I needed was a way to switch between the various sources and destinations of receive audio in my shack without having to make major renovations each time. Additional requirements were as follows:

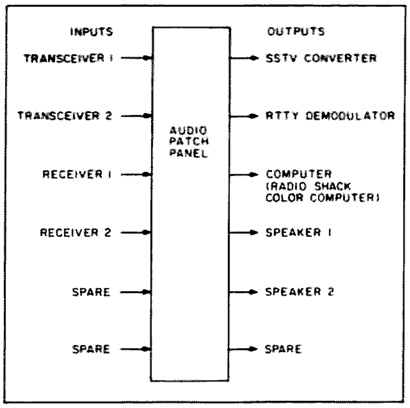


Figure 2. Block diagram, showing inputs and outputs. Phono jacks make good connectors.

1. The ability to send receive audio to more than one destination simultaneously (i.e., an SSTV converter and a speaker).
2. The ability to switch modes or rigs with minimal effort.
3. Nominal cost (no big ham budget required).

Tailor-Make Your Own

This project, which meets or exceeds the above requirements, can be completed in a couple evenings, and the total cost should not exceed $25. If you don't have an extensive parts repository (junk box), you can find all the parts at Radio Shack.

In my shack I presently have four sources of receive audio and five places to send it to, as shown in Figure 2. Based on these needs and projected expansion, I elected to build the circuit with six, six-position switches (see Figure 1.).

The circuit that you build will be decided by your present and anticipated requirements. Translated, this means that the number of switches you use is equal to the number of outputs desired, and the number of positions on the switches is equal to the number of inputs desired.

Construction is straightforward. It is actually easier to build the project than to draw the schematic in the design phase. Due to wide availability, and the great variety of patch cables and adapters designed for them, I chose phono jacks for input and output connections. The ones I used are available at

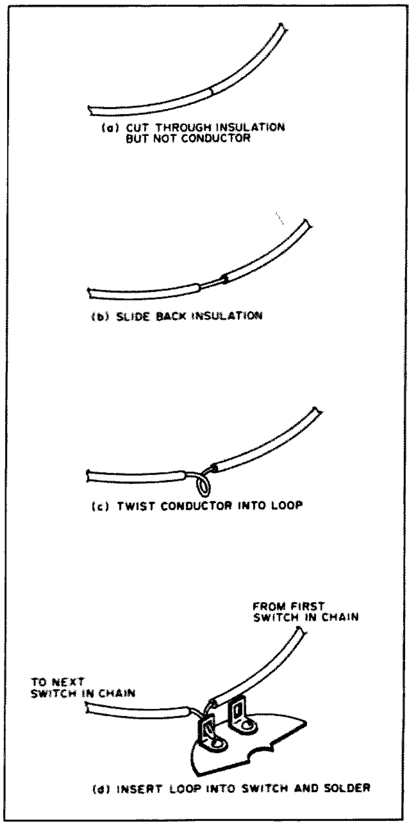


Figure 3. Slide the insulation aside, make a loop, and insert the loop through the switch terminal lug and solder it.

Radio Shack, mounted in groups of two, four, or eight.

Layout is not critical, nor is the size or shape of the enclosure. However, the enclosure probably should be metal to provide shielding from RF.

The switches, Radio Shack part # RS 275-1386, have shafts about 1.5 inches long. These will have to be shortened for front panel mounting; or you can do as I did—mount the switches on an inner panel about an inch from the front panel. The mounting plate does not have to be especially rigid because when the shafts are extended through the front panel, the whole assembly becomes quite sturdy. Care must be taken in aligning the front panel holes with those of the mounting plate to prevent binding of the switches in the final assembly.

"Now I can switch from SSTV to RTTY or WEFAX with the flick of a switch."

To make wiring as easy as possible, mount the switches on the mounting plate, but do not install the plate in the enclosure at this time.

I found a shortcut while wiring my unit which saves construction time. Instead of cutting and stripping each wire for the connections between switches, I stripped the solid copper wire at the connection point, slid the insulation to both sides, and then formed a loop in the conductor which was inserted through the switch terminal lug and soldered. This procedure is illustrated in Figure 3.

Repeat the above process for each position of the switches until you have a tap for each source available at each output switch. The photo shows the layout for the switches and the construction techniques outlined above. The use of different colors of wire for each chain will greatly simplify wiring.

After the switches are wired, you can install the mounting plate in the enclosure. The input and output connectors can be installed, but be sure to tie all the shell connections together to provide a common return, as shown in Figure 1 and the photo.

Now you're ready to finish wiring by soldering a wire from the center tap of each switch to an output jack, and by connecting the switch position chains to the input jacks.

Final assembly consists of labeling the switches and phono jacks, adding knobs, and any finishing touches. My audio switching panel was built into a speaker cabinet mainly to conserve space at the operating position.

Now I can switch from SSTV to RTTY or WEFAX with the flick of a switch. I can switch rigs just as easily, with the added benefit that my shack is a lot neater with all of those audio cables out of sight behind the gear where they belong. 73

David A. Manson N1CTI, RR 3 Box 191, Newport ME 04928.

73 Review *by Louis A. Smith, II N3BAH*

The AR-880 Pocket Scanner

Listening above 800 MHz.

Ace Communications, Inc.
10707 E. 106th St.
Indianapolis, IN 46256
Price Class: less than $200
Tel. (800) 445-7717

With the move by many agencies to the 800 MHz band, there's a natural interest in monitoring this part of the spectrum, whether you're listening to a specific agency or conducting a random search. Until recently, however, not many good receivers even covered this band, and of those that did, some only covered segments, eliminating the cellular telephone portions.

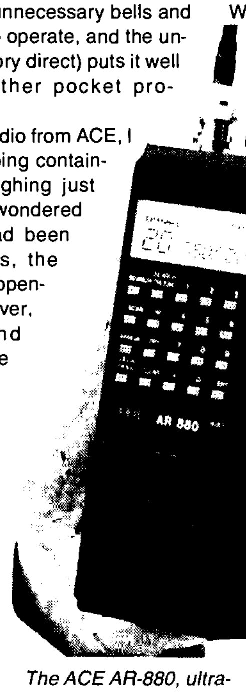
The recent introduction of scanning monitors by ACE Communications of Indiana has provided the public safety listener with a complete line of general coverage VHF/UHF AM/FM scanning receivers. These not only incorporate the traditional public service bands, but also the entire 800 MHz range as well.

New and Basic

The AR-880, newest member of the ACE family and basic model in the line, is by far one of the smallest portable scanners presently available. Its synthesized programmable receiver eliminates the need for crystals, and it covers 30–50, 138–174, 406–525, and 800–995 MHz in the FM mode, with 20 channels for frequency storage, as well as search capability. The unit's straightforward programming and lack of unnecessary bells and whistles make it easy to operate, and the under $200 price tag (factory direct) puts it well in the ballpark of other pocket programmable scanners.

Upon receiving the radio from ACE, I observed that the shipping container was very light, weighing just over a pound, and I wondered whether something had been left out (like, perhaps, the scanner itself!). After opening the package, however, I was pleased to find everything intact. The AR-880's light weight is just one of its positive characteristics.

The unit comes complete with earphone, flexible antenna, and four AAA alkaline batteries which allow immediate power-up. After attaching the antenna and putting in the batteries, you're ready to start listening! The instruction leaflet's directions are easy to understand.



The ACE AR-880, ultra-compact and lightweight.

Overall Operation

Operation is nearly identical to that of the more familiar Regency scanners. When you first turn the unit on, it's in the scan mode, and you must begin by switching to manual and programming desired frequencies into the channels via the front-mounted keyboard. You do this by keying-in the desired frequency in megahertz, followed by the two-digit channel number. You can enter any combination of frequencies at any time, and change them when you want to.

After entering the channels, you may scan them by pressing the SCAN button. You may lock out channels you're temporarily not interested in by entering their channel numbers during scanning. You may re-activate a channel by entering the number again. To monitor one particular frequency, simply press the MANUAL key until you reach the desired channel.

In order to facilitate the monitoring of repeaters or simplex systems, you can toggle the DELAY/HOLD key on and off. This four-second scan delay covers all 20 channels. With the delay off, scanning resumes less than one second after a transmission ceases.

A priority feature is also available. If a particular frequency is of primary interest, enter it into the Channel One position, which is associated with the priority monitoring mode. This mode activates a special circuit which samples Channel One every few seconds, switching to it immediately if activity is found. Toggle priority on and off by pressing the PRY key.

Search Operations

To locate new frequencies, the AR-880 searches between two user-selected limits within a band. Enter search limits by first pressing the SEARCH key.

The manufacturer's instructions mention selecting a search increment of either 5, 10, 12.5, or 25 kHz before entering the lower search range, by sequentially pressing the increment, INC, key until the display flashes the desired value at the top. However, the unit appears to assume default increments of 5 kHz between 30 and 175 MHz, and 12.5 kHz between 406 and 525 MHz. This is satisfactory since it covers all standard and nonstandard frequencies used in these bands.

For searching above 800 MHz, a unique 12.5 kHz offset is included, activated via a button on the top of the unit near the rotary ON/OFF-volume and SQUELCH controls. Pressing this button instructs the unit to search 800 MHz ranges by sampling frequencies 12.5 kHz below those displayed. Without engaging this feature, you can only search these ranges in 25 kHz increments, which could possibly result in missing some active frequencies in those areas where channel spacing in this band permits allocations "in the cracks." This control does not function on any other band.

During a search, the microprocessor-controlled, synthesized receiver passes through the frequency range in the desired increments until it finds a signal. When it locates an active frequency, the search will either remain there or resume searching after a four-second delay, depending on whether you've selected the delay or hold mode with the DELAY/HOLD key.

At any time during a search, you can switch from automatic to manual searching by pressing MANUAL. The search then stops on the present frequency. If you continue to press MANUAL or hold it down, you can step forward one increment at a time. To resume automatic searching, press SEARCH. Press SCAN to discontinue either form of search.

Specifications

Specifications for the AR-880 include sensitivity ratings of 0.4 µV on VHF, 0.5 µV on UHF, and 0.8 µV above 800 MHz. The scan rate of 20 channels per second is adequate, and audio through the 2" internal speaker is set at a little over 100 mW. Power requirements are 6 volts DC, at about 50 mA fully squelched (no audio) and 70 mA at maximum volume with audio.

The scanner's small size and light weight makes it one of the first truly pocket-size portable scanning monitors on the market. It measures just 5"H x 2¼"W x 1-11/16"D, and weighs 16 ounces with the batteries. The flexible antenna supplied with the unit is a thin, single-element type, rather than the conventional thicker, rubberized wire-wound variety, and adds a professional touch. Below this is

the 2" internal speaker, and above is the LCD display.

On top of the unit, in addition to VOLUME, SQUELCH, etc., is a keyboard LOCK button which prevents accidental entries while mobile. It also has an earphone jack for private listening.

Field Notes

In field testing, the AR-880 proved to be easy to program and operate. All keyboard sequences are logical and easy to remember, and the large LCD display, with its convenient top-front location, is easy to read and understand. The primary display characters indicating channel number and frequency are easy to view under conditions of normal lighting. In addition to these numerics, status words, such as "Search," "Delay," "Hold," and "Scan" or "Manual," are displayed, as appropriate. The frequency increments appear in smaller characters along the top of the display, and are difficult to read at a glance, but they aren't really essential due to the pre-programmed appropriate default values.

The keyboard, located at the top of the receiver's face, is comprised of 16 gray rubber keys which contrast well with the black case. They function flawlessly; they do not "bounce" (i.e., unintentionally repeat characters when pressed once) as occurs on some programmable scanners, and they do not give a positive "click" when pressed or emit a "beep" to confirm keyboard entries. This latter omission is welcome, as the annoying "beep, beep" which accompanies other monitors is embarrassing when you want to use them discreetly.

The pre-programmed decimal point for all frequencies above 50 MHz is another nice keyboard feature. If you're entering 453.450 MHz into Channel 15, you would keyboard: 45345, ENTER, 15. The microprocessor would assume your entry to be above 50 MHz and record the entry as 453.45 MHz. For frequencies between 30–50 MHz, however, it is necessary to use a decimal point. If you attempt to enter a frequency outside of the previously listed bands, an error message appears.

The RESET button is on the lower right of the keyboard, recessed behind the front panel and accessed through a small hole. If you want to erase all frequencies from both the scan and search memories, use the point of a pen to press this button.

The ON/OFF-volume and SQUELCH rotary controls operate smoothly, as do the KEYBOARD LOCK and −12.5 kHz OFFSET buttons. The BNC antenna connector conveniently allows quick connection to an external antenna when you're driving.

The battery compartment, concealed by a sliding cover, is located on the lower half of the back side of the radio. Inside the snug compartment, the four AAA batteries fit in a holder which can can also contain NiCd batteries. If you want to use ACE's optional NiCd pack, you can remove the holder to make room for it. The AR-880 can also accommodate an external power source via a sub-miniature coax jack on the left side panel. This jack will accept the ACE charger/AC adapter or other 6 volt DC power source.

The belt carrying-clip is a single piece of metal secured to the rear panel by two screws. The clip holds the scanner securely in place, and with the scanner's light weight, you even forget it's there! Or, if you prefer to carry the AR-880 in your pocket or in the optional leather carrying case, you can easily remove the clip.

The AR-880's sensitivity and selectivity on VHF proved close to the spec ratings and were average for a pocket scanner. The unit's performance on UHF, however, was outstanding! The AR-880's short flexible antenna easily received signals from stations more than 50 miles away, over mountainous terrain. The only disturbing occurrence on UHF was the near total annihilation of 470–471 MHz by internal "birdie" signals. Otherwise, the major public safety subbands of 453–454 and 460–460.600 MHz were interference-free. Several birdies just below 461 and 462 MHz hindered business monitoring in 460.6–465.0 MHz.

"The unit's performance on UHF, however, was outstanding!"

The unit also received the 800–950 MHz band with exceptional sensitivity and freedom from interference. Signals were loud and clear, and produced good audio when received dead-on frequency. I encountered relatively few birdies considering the width of this range. The search rate was good when I tracked through newly-found trunked systems. In segments of the band where channel spacing is 30 kHz, however, the disparities in channel spacing (from the receiver stepping in increments of 12.5, or 25 kHz when the allocations are every 30 kHz) sometimes caused the receiver to be 5 to 10 kHz off the actual transmit frequency. This made the audio sound tinny. These disparities can render certain frequencies unmonitorable when the receiver is 10 kHz off.

The Offset Feature

The 12.5 kHz OFFSET button received business and public safety frequencies in this band, but it wasn't intended to remedy the 30 kHz spacing problem, and it didn't. Technically, this control deducts the offset from the displayed frequency, so you have to mentally subtract it to know the actual frequency. The usual search increment in this band is 25 kHz, which is not altered when you use the offset. However, remember (especially when you're searching the 800 MHz spectrum or programming frequencies in this band) that instead of checking the displayed frequencies, the receiver is actually listening 12.5 kHz below. Therefore, you will not be covering twice as many frequencies in a search when the −12.5 kHz offset is on; rather, you will only be covering frequencies which fall in between those usually covered by a search without the offset.

Turning the offset on while scanning can result in some interesting situations. For example, what does a listener do when, among the 20 scanning channels he has programmed, some 800 MHz frequencies require the offset and others do not? It would seem practical to receive one group or the other, but not both at the same time. But you cannot program the synthesizer individually to receive and display the actual offset frequency. This could be a problem if you're going to use the AR-880 where splinter channel assignments are used alongside normal allocations.

Minor Shortcomings

The AR-880 does not have a light to illuminate the LCD display, which renders night use impossible without another source of light. The manufacturer explained that the omission of a light helps conserve minimal battery power in such a small unit.

I noted several other minor difficulties. The instruction leaflet provides sufficient information for the experienced scanner user, but it's short on details helpful to a beginner. Also, there is a lack of accurate information as to which search increment would be best to use on each band. ACE supplements the instructions with an information sheet, but it is badly in need of correction. For example, it suggests using 12.5 kHz search increments on VHF high, and states that it's lawful for amateur radio licensees to monitor cellular telephone communications. Several references to AM capability and the aeronautical band need to be eliminated, as they are carryovers from a manual for another scanner in the ACE line.

The alkaline batteries which come with the unit are good at first, but with heavy use they can be quickly depleted, making operation expensive. A better solution is to purchase NiCd batteries from a local radio shop, or the NiCd pack directly from ACE. An internal NiCd pack and charger/adapter as standard equipment would be a welcome addition.

A Contender in the Market

Despite several shortcomings, the AR-880 by ACE Communications is definitely a contender in the pocket scanner market. With its ultra-compact size, complete coverage of 800–950 MHz, good sensitivity, and under-$200 price tag, it certainly is a welcome addition to the field of pocket scanners. It's worth consideration by any hobbyist intent on listening to the world above 800 MHz. ■

You may contact Louis A. Smith II N3BAH at R.D.#6 Box 479, Latrobe PA 15650-9053.

ATV

Ham Television

Bill Brown WB8ELK
℅ 73 Magazine
Forest Road
Hancock NH 03449

Summer Fun

Just because Summer is here, don't assume that ATV activity takes a back seat to outdoor fun. Some of the best DX openings occur during June, July and August. Temperature inversions can occur regularly this time of year, particularly during the late evening hours and just before sunrise. Expect to see some 200–400+-mile openings occur in the Midwest and East Coast. If you live in a major metropolitan area you can actually use those nasty, smoggy days to your advantage. A thick smog layer is a good tipoff that a healthy inversion layer is present. ATVers in Los Angeles have made 100-mile contacts on the 1200 MHz band using less than 10 milliwatts during a Smog Alert.

Summer is a good time for mountaintopping expeditions. A small portable ATV station and small beam can net you some amazing results. Chuck WB9IHS plans an expedition to the top of 6,900-foot Mt. Mitchell, North Carolina, this May. Don K4SAO and KC4CTW operated from nearby Mt. Roan last year making some 350-mile contacts with the aid of an early morning enhancement. Try and coordinate with another group to attempt a mountain-to-mountain contact. Rod WB9KMO operated from 9,000-foot Mt. Pinos during the UHF contest in 1981. I drove up to a 5,500-foot peak near the entrance of Yosemite. Even though we were 200 miles apart I could see an excellent picture using just a quarter-wave whip attached to my TV. Needless to say, he was P-5 with my tripod mounted beam. During this coming Field Day, Cal WA1WOK will be operating ATV from 6,600-foot Mt. Washington, the highest point in New England, which should net him contacts over a several-state area.

Those of you in the flatlands of the Midwest shouldn't despair! Summer is the perfect time to convince any pilot friends to give you and your ATV system a ride. Create your own mountains and band openings! Just attach a magmount to the landing gear (use furnace tape to secure it) and prepare to make some 100-mile or more contacts. Bring along a video recorder and try operating as a "delay-action" ATV repeater. This is a great way to hook up isolated groups who normally don't work each other.

An EAA (Experimental Aircraft Association) meeting or fly-in is a good place to meet pilots who may be interested in taking you aloft. Bring along a portable ATV system and a TV set. Offer to provide live video from the cockpit of one of these experimental crafts to the TV set in the hangar so that everyone can "fly along." You'll probably have several pilots waiting in line to take you up. Jeff KA8WLV visited one of these fly-ins and ended up televising a very exciting flight from the back seat of a restored WW II fighter. They even simulated a dogfight as well as some hair-raising "strafing" runs. The crowd in the hangar loved the show and asked lots of questions about ATV and amateur radio.

Try attending a hot-air balloon exhibition. Shouldn't take much arm twisting to convince one of the balloonists to take your ATV station along . . . and of course someone to operate it! Not only will you get the ride of a lifetime, you'll provide your local ATV group with a real thrill. Earl KS8J and Tommy N7KBO of the Phoenix AAA5 club took this idea one step further and held their marriage ceremony aboard a hot-air balloon, while transmitting the event via ATV down to the crowd below!

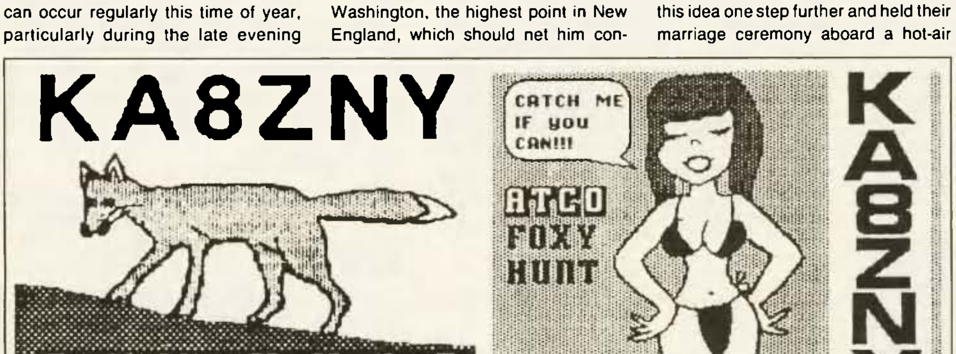


Photo A. Computer screens transmitted from the "FOX" (ATCO Foxhunt).


Photo B. BRATS ATV Foxhunt (Davenport, Iowa).

ATV Foxhunt

There's nothing like a foxhunt to get the locals together for a little friendly competition. Several ATV groups have decided to add a new dimension to foxhunting . . . the Video Foxhunt. Armed with nothing more than TV sets and a variety of mobile directional antennas the ATCO group (Amateur Television of Central Ohio) positioned themselves around Franklin county for their first hunt in the fall of 1988. The hidden transmitter powered up with 50 watts on 439.25 MHz, with a computer screen depicting a "Fox." They used high power for just one minute to allow distant stations to get their initial bearing. Then they dropped power to 2 watts for the duration of the chase. It's always fun to see the lenghths an ATVer will go through to build up his "secret weapon" mobile tracking station. Dick W8RVH definitely got a number of stares from passers-by when he would periodically raise his beam on the side of the freeway on top of a 15-foot pole! KB8UU had a long yagi fixed in the bed of his pickup truck. This setup was very effective but required a large parking lot to rotate his antenna. The winner of the day was Bill W8DMR with his PVC loop antenna suction-cupped to the side of his car door. This turned out to be quite a social event with a huge potluck dinner . . . however, to join in the feast you had to find it!! Where did the wily fox hide??? Where else but at a Cable TV site surrounded by satellite dishes! A number of trackers drove by the site since they thought it was too obvious a place to hide.

The BRATS group (Big River ATV Society) of Davenport, Iowa, has a number of successful foxhunts to their credit. This year six vehicles with two or more "hunters" met at St. Ambrose College to chase out after the "rabbits." The rabbits were Matt N0GIK and Phil N9ZK, the winners of last year's hunt. The "rabbits" hid out in the parking lot of the Illinois State Police in East Moline. Matt and Phil used a 10 watt transmitter and the high location provided a good signal for the "hunters" to track down. First place was awarded to the team with the best time and mileage. This year's winners were WB0FBP, WD0AMA and WB0SBL arriving in 38 minutes after driving 20.9 miles. Second place went to WB0BIZ and WB0OLX. Over 18 amateurs joined in this event for their largest foxhunt yet!

Walk-a-Thon ATV

The Western Vision ATV group of Denver decided to add video coverage to help out with the Super Cities Walk for MS. Five portable checkpoints were set up along the route, with Dave W6OAL and YL Margie acting as roving mobile. Using 144.34 MHz as coor-

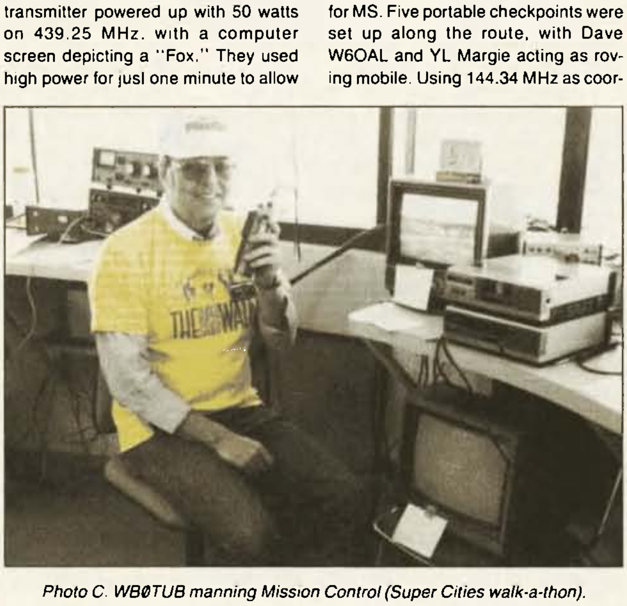


Photo C. WB0TUB manning Mission Control (Super Cities walk-a-thon).

Photo D. W6OAL roving mobile (Super Cities walk-a-thon)

dination frequency, Tim WB0TUB, Steve NV9O and Sue Hoffman, located at mission control, were able to request video from each of the checkpoints. Video was P-5 from all checkpoints including some great shots from the roving mobile. The walk-a-thon officials were quite impressed with the coverage.

Members of the Western Vision group will also be participating in a unique way to aid the National Weather Service and SKYWARN during severe weather. Several mobile ATV stations have been put together to act as weather spotters. The mobiles will actually be able to send back live video of the severe weather direct to the SKYWARN center via a link to the ATV repeater on top of 7,400-foot Lookout Mountain. In addition, N0HMV in Loveland (70 miles away) and N0HZY in Denver have tower-mounted cameras available for weather coverage in their areas. Also Oliver N0JBK can provide a camera view from the roof of his building in Englewood when needed. The Lookout Mountain repeater has an input on 426.25 MHz with an additional input soon to be on 1277.25 MHz. The output is on 1253.25 MHz and provides coverage to the greater Denver area. If you're in the area, give the Western Vision group a call on 144.34 MHz. They have an activity night every Monday night at 8 p.m.; they can also be found each Thursday night at 7 p.m. on the 147.225 (-600) repeater. *(Thanks to Oliver N0JBK and Sharon N0JBG for this information.)*

Recently ATVers in Albany, New York, participated in a campus run around the SUNY-Albany campus. Several portable stations were set up to cover the event. Their next endeavor will be to provide coverage for a regatta on the Hudson river. If you're in the Albany area give the ATV group a call on 146.49 simplex or via the K2CBA repeater on 145.31 (−600). Thanks to W2MTE and K2CBA for information.

Summer Balloon Launches!

Keep looking to the sky this summer. If all goes well there will be a balloon launched each week starting June 30th. Each balloon will have an ATV transmitter and a two meter beacon for tracking as well. Coverage range should be around 400 miles from launch point.

- June 30, 9 a.m.—WB8ELK "live camera" flight launched from *73* headquarters in Hancock NH. ATV: 439.25 MHz; FM: 144.34 MHz; HF net: 7.155 MHz.
- July 7, 10 a.m. CDT—KD0FW "live camera" launched from east of Kansas City MO. 3 watts ATV: 439.25 MHz; FM: 144.34 MHz & 52.525 MHz; HF net: 7.232 MHz.
- July 14 (alternate dates: July 15 and July 21), 1300 UTC—K4BV "Sky Beacon one" balloon from The Crystal River, Florida airport. Alternate launch site is Inverness, Florida. ATV: 434 MHz (vertical); FM: 144.34 MHz; HF net: 7.155 MHz. Contact John Bayne N4EEB, 7 Castle Manor Dr., Ormond Beach FL 32174 for more details.
- July 21, 9 a.m. CDT—NJ9Y launch from Champaign IL. ATV on 439.25 MHz (horizontal), 144.340 MHz (vertical); 28 MHz band CW transmitter; HF net: 7.155 MHz.
- Date and time to be announced—W0RPK & WB8ELK/KA8TEF/KA8LWR dual balloon packet digipeater experiment. Two balloons to be flown at the same time from Des Moines, Iowa, and Bucyrus, Ohio (600 miles apart). After reaching 50,000 feet packet stations will be able to link through both balloons for coverage of a large part of the Midwest.

All balloon launches & special events will be announced via the ATV net on 3.871 MHz each Tuesday night at 8 p.m. EDT, the AMSAT net on 3.840 MHz (Tuesday at 9 p.m. EDT & CDT, 8 p.m. PDT), as well as on your local packet BBS. Also, we've started an ATV SIG on the *73* phone-line BBS. Dial in on (603) 525–4438 for up-to-the-minute details. This is an open forum for anyone with questions or announcements concerning ATV. Stay tuned . . . 73

Number 20 on your Feedback card

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston TX 77083

More Hamsats on the Way

As if 10 operational amateur satellites weren't enough, more are expected very soon. The September 1989 column detailed a proposed frequency plan for RS-12/13. Those 10, 15 and 2 meter frequencies have been confirmed by letter from Andy RS3A at the RS control center in Moscow (see Photo A). The launch date of RS-12/13 is still in question—it could be any time this year.

Activity on the RS-10 Mode A transponder (2 meters up and 10 meters down) continues, but it has been a while since the Mode T unit (15 meters up and 2 meters down) has been active. When RS-12/13 is launched, we hope its Mode T system will be activated regularly. Signals from Mode T on 2 meters come through very well. And there's more.

MIR Activity

Photo B shows a QSL received for a contact with U2MIR on the Soviet Space Station *MIR*. The current crew has not had much time for amateur radio activity, but more is anticipated. If you have made a contact with any of the cosmonauts, QSL via UW3AX. Boris has been responding directly to those who include a self-addressed envelope and IRCs. Frequencies to watch for *MIR* activity include 145.500 and 145.550 MHz FM simplex.

RS-14

RS-14 has been scheduled for a June 1990 launch from the Plesetsk launch facility located 800 km north of Moscow. Like RS-10/11 and RS-12/13, this amateur payload is a part of a larger satellite. RS-14 is attached to GEOS, a Russian geological research satellite. The proposed orbit is circular and 1000 kilometers up with a period of 105 minutes.

The January 1990 column briefly outlined some of the satellite's capabilities. More information is available now that the launch is imminent. See the tables for details. The amateur radio equipment includes two analog transponders, both using Mode B (70 cm up and two meters down), and the West German RUDAK 2 package.

Satellite enthusiasts who operated in the mid-seventies fondly remember the quality of Mode B analog communications on the low-orbit AMSAT-OSCAR 7. AMSAT V.P. of Engineering, Jan King W3GEY, performed tests via the B transponder on A-O-7 over 15 years ago and determined that signals as low as 120 mW ERP (effective radiated power) could be heard through the satellite.

The success of Mode B on A-O-7 inspired Mode B operation on the Phase 3 high-orbit satellites (AMSAT-OSCARs 10 and 13) as the main transponder configuration. The analog receiver on RS-14 is expected to be as good as or better than A-O-7, while the transmitter is capable of 10 watts output. Omnidirectional antennas and low power (10 watts ERP on the uplink) are expected to be sufficient for easy Mode-B work with the RS-14 analog system.

During early 1989, Peter DB2OS and Leo UA3CR had many intensive discussions concerning a joint effort between the RUDAK group in Munich, the AMSAT-U-ORBITA group in Molodetchno near Minsk, and the Adventure Club in Moscow for the design and construction of an amateur satellite. A contract was signed in Surrey, England in the summer of 1989 by Dr. Karl Meinzer DJ4ZC (designer of A-O-7's Mode B transponder), Hanspeter Kuhlen DK1YQ, and Leonid Labutin UA3CR, for the start of a venture known as the RUDAK-2/RADIO-M1 project. Due to amazing efforts on the part of the RUDAK group, the complete digital satellite package was built and presented to representatives of AMSAT-U-ORBITA in Munich on January 21, 1990. Final integration and testing was completed a week later in Molodetchno in the Soviet Union.

RUDAK stands for Regenerative Transponder for Digital Amateur Radio Communications and is basically a complex multispeed packet radio store-and-forward system. Stations equipped for operation via the microsats will be able to connect to and through the RUDAK system on RS-14, at least via the 1200 bps uplink. Note (in the table) the different data speeds and modes that are supported. Uplinks range from 1200 to 9600 bps and downlinks from 400 to 9600, with digitally-created speech as an option. Beacon digital telemetry (30 parameters) *is* 1100 bps PSK; this is not an error. RS-14 promises to be an exciting hamsat addition.

PSK and the MicroSats

Last month's column described the different PSK (phase-shift keying) modems by TAPR (Tucson Amateur Packet Radio Corporation), G3RUH and PacComm. The May column showed the TAPR unit while a version of the G3RUH design was presented in June. This month, Photo C depicts the

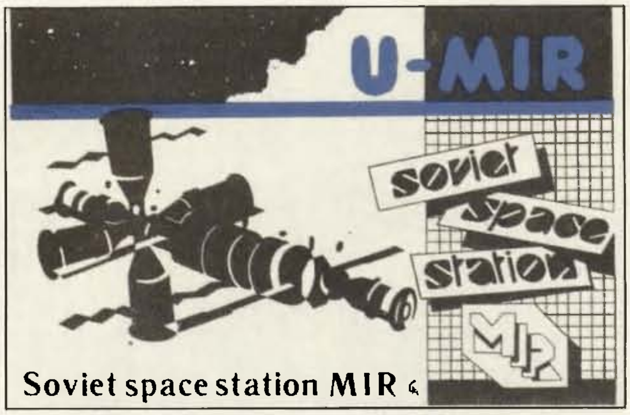


Photo B. QSL card for a QSO with the Soviet Space Station MIR.

RADIO-M1/RUDAK-2 Data Sheet
AMSAT-DL/AMSAT-U Joint Project

RUDAK II (2nd generation) is a part of the Russian amateur radio transponder "RADIO-M1." "M" refers to Molodechno, White Russia, USSR. RUDAK is the German abbreviation for "Regenerative Transponder for Digital Amateur Radio Communications." The transponder is a joint project of AMSAT-U-ORBITA in Molodechno, the Adventure Club in Moscow, and AMSAT-DL/RUDAK group in Marburg, Munich and Hanover.

Launch: June 1990 from Plesetsk, USSR with PROTON rocket.
Satellite: "Subtenant" to GEOS, a Russian geological research satellite.
Orbit: Circular orbit at 1000 km altitude and 83 degrees inclination. Orbital period is 105 minutes.
Total power consumption: 40 watts maximum.
Total mass: 22 kg
Total dimensions: 480 x 400 x 300 mm
Amateur Radio Payload: Linear and Regenerative Transponders for analog and digital communications and telemetry beacons.

Photo C. The "plug-and-go" PacComm PSK modem. (Photo by Walter Holmes WD5GAZ.)

Photo A. Andy RS3A at Soviet RS satellite command station.

Linear Transponder 1

Uplink: 435.102–435.022 MHz (80 kHz)
Downlink: 145.852–145.932 MHz (inverted)

Output power: 10 watts maximum.
Beacon CW telemetry (8 parameters): 145.822 MHz, 0.2 watts
Beacon digital telemetry (30 parameters): 1100 bps PSK
R+Scrambler 2 kHz deviation: 145.952 MHz, 0.4 watts

Linear Transponder 2

Uplink: 435.123–435.043 MHz (80 kHz)
Downlink: 145.866–145.946 MHz (inverted)

Output power: 10 watts maximum
Beacon CW telemetry (8 parameters): 145.948 MHz, 0.2 watts
Beacon digital telemetry (30 parameters): 1100 bps PSK
R+Scrambler 2 kHz deviation: 145.838 MHz, 0.4 watts
Beacon digital telemetry (30 parameters): 1100 bps PSK
R+Scrambler 2 kHz deviation: 145.800 MHz, 2 watts

PacComm modem connected and ready for microsat communications. A complete review of the PacComm modem is scheduled for a future issue of *73*. This unit is not a kit. It comes complete with cables and a detailed operation manual.

While integrating a PSK modem into a station is not a simple task, PacComm makes the chore less of problem with this plug-and-go unit. No tune-up procedures are required.

While the software difficulties with DOVE (DO-17) slowed the store-and-forward programming efforts with PACSAT (AO-16) and LUSAT (LO-19), pictures continued to come from WEBERSAT (WO-18).

Many of the images sent via PSK packets and decoded using Weberware 1.0 software for IBM PCs and compatibles were too dark, too light, or just impossible to distinguish. A few shots of cloud banks or coastlines were excellent, but hard to identify.

In late April, new software was uploaded to allow iris control and the use of the 1265 MHz ATV uplink receiver. It is hoped that these modifications will provide better pictures of the Earth, and opportunities for ATV stations to send pictures for retransmission via the PSK packet downlink format. WO-18 transmits on 437.102 MHz plus or minus about 10 kHz of Doppler shift. As the controllers at Weber State University in Ogden, Utah, gain more experience, the images from this fantastic experiment in space will improve.

New Publication

OSCAR Satellite Report continues the tradition of *ASR (Amateur Satellite Report)* with a biweekly newsletter sent via first class mail. The first issue was labeled "Number 194," signifying its continuity with the last *ASR* (No. 193). *ASR* was discontinued by AMSAT in favor of the more technical *AMSAT Journal*, a magazine published six times per year for AMSAT members.

OSR is a subscription-based publication, independent of AMSAT, but with ties to the goals and objectives of that organization. For those who do not monitor the AMSAT HF and satellite nets, and who do not have access to the packet radio AMSAT bulletins, *OSR* provides timely information via mail on the amateur satellite program. Additional features include various columns, such as "DXing the OSCARs" from John Fail KL7GRF, along with short articles and current orbital elements for existent hamsats.

OSCAR Satellite Report is published by R. Myers Communications, PO Box 175, Litchfield CT 06759. Subscription rates are $26.00 U.S., $27.50 Canada, and $36.00 elsewhere (in U.S. funds).

Regenerative Transponder RUDAK-2

Two onboard computers with IPS operating system for packet radio (AX.25) (Mailbox, telecommunications experiment with digital signal processing up to nearly 20 kHz, etc.), 1 megabyte RAM disk. Four separate uplink channels.

Gain of satellite RX and TX antennas: 2.3 dBi each (dipoles)
Input sensitivity: < −125 dBm (435 MHz) for a C/No of 45 dB Hz

Uplink

SAT-RX-1:	435.016 MHz ± 10 kHz 1200 bps, FSK, NRZIC/Biphase-M (JAS, PACSAT)
SAT-RX-2:	435.155 MHz ± 10 kHz (AFC) 2400 bps, BPSK, Biphase-S
SAT-RX-3a:	435.193 MHz ± 10 kHz (AFC) 4800 bps, RSM, NRZIC/Biphase-M
SAT-RX-3b:	435.193 MHz ± 10 kHz (AFC) 9600 bps, RSM, NRZI (NRZ-S) + Scrambler
SAT-RX-4:	435.041 MHz ± 10 kHz (digital AFC) RX for RTX-DSP experiments

Output signals of RX-4 are the In-phase and Quadrature components, I(t) and Q(t), which are sent to the DSP RTX immediately after analog/digital conversion with 8 bit resolution. This supports various modulation modes, depending on the software. All other receivers provide data (D) and clock (C) at their outputs.

Downlink

The downlink can be switched to the following operating modes:

Transmit frequency: 145.983 MHz
Output Power: 2 watts nominal (10 watts maximum)
Mode 1: 1200 bps BPSK, NRZI (NRZ-S) (like FO-20)
Mode 2: 400 bps BPSK, Biphase-S (AMSAT mode for OSCAR-13 beacon)
Mode 3: 2400 bps BPSK, Biphase-S (planned for OSCAR-13)
Mode 4: 4800 bps RSM, NRZIC (Biphase-M) (like 4800 bps uplink)
Mode 5: 9600 bps RSM, NRZI (NRZ-S) + Scrambler (like 9600 bps uplink)
Mode 6: CW keying (only for special events)
Mode 7: SK (F1 or F2B), e.g. RTTY, SSTV, FAX, etc. (only for special events)
Mode 8: FM modulated by D/A signals from DSP-RISC processor (e.g. speech)
Power consumption: 14 volts at 350 mA (max) = 4.9 watts
Standby: 80 mA (RUDAK without power amplifier)
Mass: 6.2 kg
Dimensions: 230 x 320 x 120 mm

The C-64 Inductance/ Capacitance Meter

Let this popular PC help you obtain values for capacitors and inductors.

by G.M. Gaskill KD9EN

Most amateurs can easily measure resistance, voltage, and current, but they usually have to guess the inductance from the mechanical dimensions. This home-brew product uses the Commodore 64 computer and a simple test circuit to measure inductance, capacitance, and frequency. It is a big help on any project which requires accurate values of inductors or capacitors.

This article is based on two earlier *73* articles: "All About Henry," in the November 1988 issue and "Computerized Frequency Readout" in the January 1988 issue. The original circuit has one component change, namely C1 (see Figure 1). The C-64 software program has been modified and expanded for the automatic calibration of the inductor (LS) and the determination of either inductance (LX) or capacitance (CX).

An Overview

The computer first measures and remembers the natural frequency of the inductor (LS) and the capacitor (C1). It then measures the frequency of LS, C1, and the unknown component. Finally, it computes the value of LS and the unknown component. It is not smart enough to determine if the unknown component is an inductor or a capacitor. Therefore, it gives two answers. You must decide whether it is a coil or capacitor.

C1—The Hard Part

This project requires the use of a stable capacitor, C1, of known true value. The accuracy of all measurements depends on this single component because the value of inductor LS is based on C1. This circuit is unique in that the output frequency is nearly totally dependent on LS, C1, and the unknown component. The best way to ensure the accuracy of C1 is to purchase a 0.01 μF Panasonic P-Series 2% tolerance Polypropylene Capacitor, a JE-3PLY 01 2.5% Tol. or equivalent.

However, it would be easier to purchase one with wider tolerances from a local electronic supplier, then ask the clerk to measure it on one of his demonstration digital capacitor meters.

Once you learn the exact value of C1, change line 1010 in the program to that value. Take care to insert the value in farads. For example, C = 0.01005/1000000 or C = 0.009983/1000000 will do nicely.

Ideally, the inductor should be a toroid in order to avoid mutual coupling between the LS and the coil under test. A hand-wound toroid is easy to make. Fifteen to 20 turns of wire on a toroid form should do the job. However, you can also use a Radio Shack 0.1 mH choke and RS 273-102. The natural frequency of LS and C1 must never exceed 655,350 Hz. This would cause an underflow in line 320.

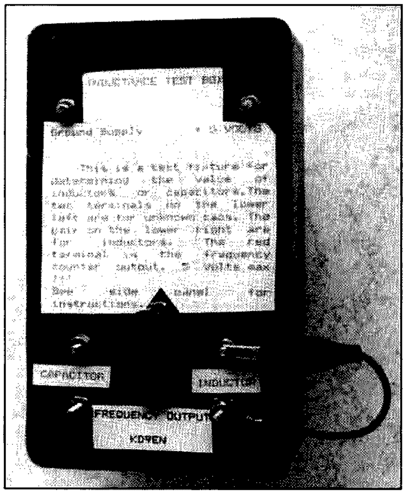


Photo A. Test fixture for measuring inductance and capacitance.

The Hardware

It would be best to mount the circuit board within a metal box, but it is not absolutely necessary. I used clip leads for all external connections (see Photo A). A switch, however, would be more convenient.

The normal current drain for the circuit is 4.0 mA. It would be prudent to test with an external power supply before connecting to the C-64.

The Software

The C-64 has a built-in counter and a time interval program. The counter counts down from 65535 and must not go below zero dur-

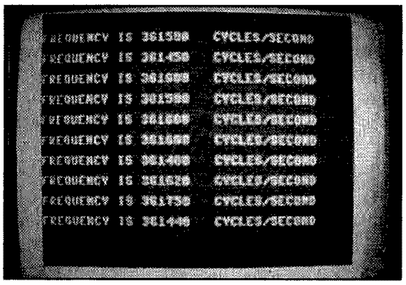


Photo B. Repeating display of measured frequencies. Wait until the frequency displays (and thus the oscillator) stabilizes before seeking the desired component value.

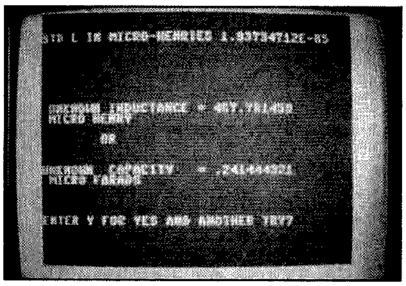


Photo C. The final screen display, giving you a choice of solutions for the unknown component.

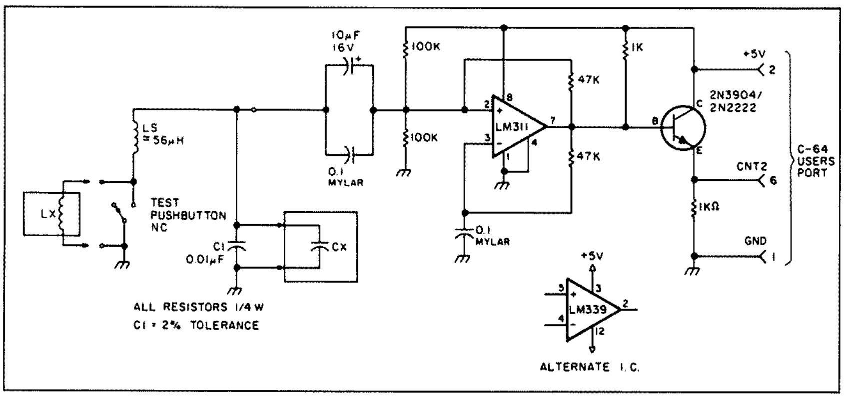


Figure 1. Schematic diagram of inductance/capacitance meter circuit.

```
                              PROGRAM LISTING

8 REM FILE NAME   MEASURE L/C
9 REM AUTHOR GEORGE M. GASKILL KOKOMO,          INDIANA  KD9EN
10 REM C-64 DIGITAL FREQ COUNTER
11 REM REF 73 MAG. JAN 1988 PAGE 35/36
12 REM MAX COUNT = 65535
13 REM ACTUAL COUNT IS (65535- COUNT)
14 REM COUNT BASED ON JIFFY COUNTER
15 REM 60 JEFFIES = 1 SECOND LINE 290
16 REM INPUT IS ON PIN CNT2  USERS PORT
17 REM CNT2 IS PIN #6 ON USERS PORT
18 PRINT"{SC}"
20 PRINT"THIS PROGRAM MEASURES FREQUENCY,"
22 PRINT:PRINT"    INDUCTANCE AND CAPACITANCE."
24 PRINT:PRINT:PRINT"IT REQUIRES THE USE OF A SPECIAL"
26 PRINT:PRINT"    TEST BOX."
28 PRINT:PRINT:PRINT"THE FIRST TEST IS A CALIBRATION"
30 PRINT:PRINT"    TEST WITHOUT ANY UNKNOWN COMPONENT"
32 PRINT:PRINT"    IN THE CIRCUIT."
34 PRINT:PRINT:PRINT" WHEN THE FREQ. SETTLES DOWN,"
36 PRINT:PRINT"    HIT THE RETURN KEY"
37 PRINT:PRINT" ******    PLEASE WAIT    ******"
42 FOR J=1 TO 9000:NEXT
120 DATA 8,120,169,20,141
130 DATA 20,3,169,192,141
140 DATA 21,3,169,3,141
150 DATA13,221,40,88,96
160 DATA 72,198,255,240,4
170 DATA 104,76,49,234,165
180 DATA 251,133,255,169,0
190 DATA 141,14,221,173,5
200 DATA 221,133,252,173,4
210 DATA 221,133,253,169,255
221 DATA 141,5,221,141,4
230 DATA 221,169,33,141,14
240 DATA 221,104,76,49,234
250 FORI=0TO64
260 READX
270 POKE(49152+I),X
280 NEXTI
285 REM BASE=60 MEANS ONE SECOND OF COUNT
286 PRINT"{SC}"
290 BASE = 06: REM 1/10TH SEC.
300 POKE255,0:POKE251,BASE
310 SYS49152
320 COUNT=(PEEK(252)*256+PEEK(253))
330 F =(65535-COUNT)*10:IFF=655350GOTO450
331 PRINT:PRINT"FREQUENCY IS"; F; "  CYCLES/SECOND"
450 FORW=0TO1000:NEXTW
460 GETA$:IFA$=CHR$(13)GOTO480
470 GOTO320
480 PRINTCHR$(147):GOTO 520
520 PRINT"{SC}"
530 PRINT:PRINT:PRINT" THE FREQUENCY =";F;" HZ"
532 PRINT:PRINT"      XXXXXXXXXXXXXXXXXXXXXX   "
540 PRINT:PRINT"IF THIS IS THE CALIBRATION"
550 PRINT:PRINT"    FREQUENCY PRESS F."
560 PRINT:PRINT"PLACE THE UNKNOWN IN THE CIRCUIT"
580 PRINT:PRINT"   AND ENTER S FOR SECOND FREQ."
585 PRINT:PRINT:INPUT" ENTER F OR S";B$
590 IF B$=CHR$(83) THEN 700
600 PRINT" KEY = F": FT=F:GOTO320
700 PRINT" KEY = S": GOTO 1010
1010 C= .01000/1000000
1020 PRINT"{SC}"
1040 L=1/(39.4784176*FT*FT*C):PRINT
1050 PRINT"STD L IN MICRO-HENRIES";L
1060 PRINT:PRINT
1080 PRINT : PRINT: PRINT
1090 L1=1/(39.4784176*F*F*C)
1100 C1=1/(39.4784176*F*F*L)
1110 LS = (L1-L)*1000000:REM MICRO HENRY
1120 PRINT
1130 CS = (C1-C)*1000000:REM MICRO FARAD
1140 PRINT" UNKNOWN INDUCTANCE =";LS;"        MICRO HENRY"
1150 PRINT:PRINT"        OR  "
1160 PRINT:PRINT
1170 PRINT"UNKNOWN  CAPACITY   =";CS;"        MICRO FARADS"
1190 PRINT:PRINT:PRINT
1191 INPUT"ENTER Y FOR YES AND ANOTHER TRY";A$
1192 IF A$ = CHR$(89) GOTO 320
1193 PRINT"  +++++ END  OF  PROGRAM +++++"
1194 PRINT"   ---- BYE BYE KD9EN ---"
1210 END

READY.


READY.
```

ing the counting interval. The counting interval is divided into jiffies. Each jiffy is 1/60 of a second. Line 320 contains the count and line 290 contains the number of jiffies, namely six. Thus the counter counts for just 1/10 of a second. The program for reading frequency begins with line 120 and ends with line 280. Line 310 activates this subroutine. Line 330 calculates the frequency.

The calculations for inductance and capacitance use the well-known relationship of inductance, capacitance, and frequency. These appear in lines 1040, 1090 and 1100. Because the unknown inductor is in series with LS, or the unknown capacitor is in parallel with C1, it is necessary to subtract either LS or C1 to obtain the value of the unknown component. See line 1110 and line 1130. Lines 18, 286, 520 and 1020 require special attention. The four characters within the quotation marks represent shifted clear, SC. This command is achieved by pressing the shift key while striking the CLR/HOME key. An inverted heart-shaped graphic will appear on the screen.

"This circuit is unique in that the output frequency is nearly totally dependent on LS, C1, and the unknown component."

Operating Instructions

The user's port is located on the left rear and has 24 pins in two rows of 12 each. Viewed from above and while sitting in front of your Commodore, pin #1 will be to the far right. Pin #12 will be to the far left. These pins are located on the upper row of pins. Check your owner's manual.

1. Connect the circuit to the C-64 before turning on the computer.
2. Load and Run the program.
3. Make sure that the lower connection to LS is connected or switched to ground.
4. There will be a screen display and short delay. Then the frequency display will begin repeating itself (see Photo B). After the frequency stabilizes, hit the return key.
5. It will ask if this is the first (F) or second (S) frequency display. Enter F and hit return.
6. Connect the unknown component into the proper part of the circuit. If it is an inductor, press the switch to test or connect the coil in series with LS and ground. If it is a capacitor, connect in parallel with C1. Wait for the frequency to stabilize, and then hit return.
7. This is the second frequency display, enter S and hit return.
8. Two sets of results will appear. You must select the proper value, depending on the type of component (see Photo C).
9. Enter Y to continue, N to quit.

Quantity	Value, Type	Description
2	1kΩ	resistors
2	47kΩ	resistors
2	100kΩ	resistors
2	1 µF	Mylar™ capacitor
1	10 µF 16V	capacitor
1	0.01 µF 2%	capacitor
1	56 µH	inductor
1	LM311 or LM339	IC
1	2N2222 or 2N3904 NPN	transistor
1	SPDT	Momentary Switch
1	24-pin connector	for user's port

Parts List

Parts are available at Radio Shack.

The inductor can be 26 turns of #26 enamel wire on an Amidon FT-37-61 Ferrite Toroid (125 mu). This should produce about 40 µH. Amidon Assoc., 12033 Otsego St., N. Hollywood CA 91607.

Final Words

There does not appear to be a limit on the range of inductors which this system will measure. However, electrolytic capacitors do not perform properly, and capacitors larger than 0.25 µF cause strange oscillations higher than the calibration frequency and give false results. Bear in mind that absolute accuracy is not attainable because of inductive and capacitive stray coupling of the wiring and components.

My compliments to Mr. W.K. McKellips WB4DCV for the excellent oscillator circuit used in this application, and to Mr. William Bawn WA9RDE, who wrote the original program and helped me correct a defect in my use of his work. My thanks to John DeLong W9BYN for his help and encouragement. ■

George M. Gaskill KD9EN, a retired physicist, also builds grandfather clocks. He prefers RTTY to code, and he's on 14.318 MHz nearly every morning about 1500 hours Zulu with the "Delco" net. He will provide a diskette with the program and a calibrated 0.01 µF capacitor for $8.00 ppd. Write him at 1511 N. Phillips St., Kokomo IN 46901.

Hooked on Foxhunting

Confessions of a foxhunting junkie.

by Clifford Vaught N9FHF

In the summer of 1984 I was first introduced to foxhunting. I was fascinated with it early on and now have become hopelessly addicted to the sport. Yes! After much deliberation over my direction finding activity, I hereby unequivocally admit to the amateur radio world, and to myself, that I am a foxhunting junkie.

They say that admitting your addiction is the first step to recovery. Then one must join a support group. I have already done that. Although, I sometimes wonder, as does my wife, if I'm getting the right kind of therapy. I joined a group of other foxhunting enthusiasts who meet regularly to discuss the thrills and chills of the activity. But, let me warn you about how I got hooked on this "drug."

A few months after I received my ham ticket, Paul Bohrer W9DUU was the guest speaker at our repeater association meeting. As I watched him carry in some of his equipment, I was interested in the pieces that looked like H's on long poles. There were tall ones and skinny ones, short ones and fat ones. Some appeared to be made of wood, others of plastic. Some were not much more than wire and tape. No two of them seemed to be exactly alike. Other pieces of the equipment I recognized as beam antennas. Then there were those metal boxes with meters and LEDs. I knew I had a lot to learn.

Challenged by the Force

As Paul began describing how some of his gear was made and used, my interest was piqued. Then, when he got into some of his war stories, my attention was arrested. Suddenly, as if being born anew, I saw foxhunting as I never thought I would. It was not about home-brewing those funny little antennas. Foxhunting was about a challenge. A dare to the amateur from an invisible force. It was as if radio frequencies were saying to me "I dare you to locate my source. You, with such limited radio knowledge will never be able to track me down." Well! That was just about all I needed.

Our speaker went on, and I began to feel the romance of the sport. I could be like a knight going into battle and conquering over the evil enemy. And, not only was there the three F's: fun, food and fellowship, but a practical side also.

Paul told of tracking stuck police transmitters and kitchen appliances causing TV interference; of ferreting out malicious interference and DFing stolen radios. Wow! I had really hit the jackpot. I could become a knight, conquering evil with my lance made in the shape of an H. What more could a middle-aged romantic want out of life?

Photo A. Cliff N9FHF, conquering evil with a lance made in the shape of an H.

My two friends and I decided to build antennas and enter the next monthly hunt. After all, it seemed harmless enough. The battle started out easily. We assembled with the other DFers for the September hunt. Using only the buzz box or H antenna, we decided to triangulate our headings from different locations. It was a beautiful day for the activity. The fox had hidden and was ready to make his first transmission at 1:45 p.m. We waited anxiously. When the signal came, we took our reading and drew a corresponding line on our map. Then, after moving about five miles to the northwest, we found an open area and took our second reading. Another line was drawn. The two lines intersected a few miles to our northeast.

Thrilled that the system was working just as W9DUU had said, we jumped back into the car and headed to where "X" marked the spot, thinking this was really going to be a snap. We entered the area less than a hundred yards south of our X. The next reading we took put our third line almost directly through the bull's-eye.

The problem we faced was it was one of those "you can't get there from here" situations. Dead-end streets, woods and ravines were in front of us. We wandered around trying to find a shortcut to the other side, but we ended up being led astray by multipath and our own uncertainties. We crisscrossed back and forth, taking few readings but checking out every place where we just "knew the fox had to be."

A First Success

Finally, we recognized an area just a little north of the spot from which we had taken our third reading. Upon finding an open area, we waited for the next transmission. This time our heading was almost due south. We could see no street there, but the map showed one coming in from the west that ended in a cul-de-sac due south of us. Eureka! The sly old fox had been found. It was 2:30 p.m., and we were the first ones to find the little animal. We headed for the local burger shop to wait for other hunters so we could boast and otherwise be stroked.

We waited and waited for someone else to show. We began to wonder if this had really been a snipe hunt, with us left holding the bag. Then at about 4:00 p.m. we heard on the radio that two hunters had given up and gone home. Then at 4:30 came the announcement

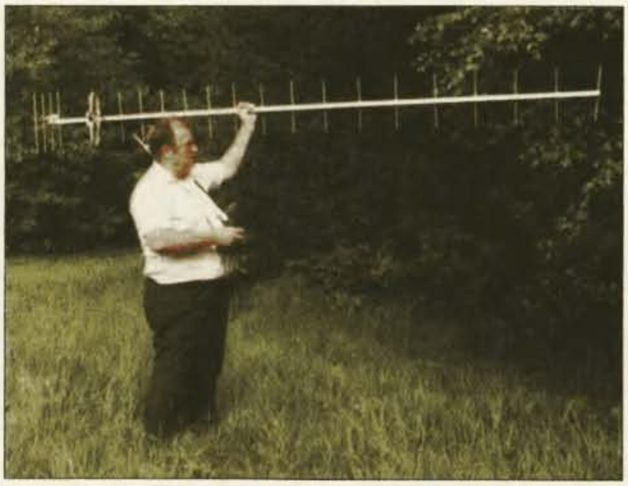
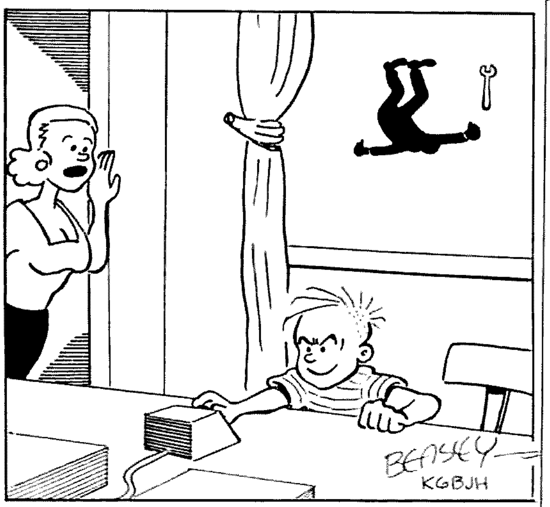


Photo B. Tom N9DZJ with his "secret weapon" foxhunting beam.

Photo C. Paul W9DUU homes in on the fox.



I TOLD YOU NOT TO PLAY WITH THAT ROTOR CONTROL UNTIL YOUR FATHER COMES OFF THE TOWER!

Number 40 on your Feedback card

UPDATES

Get the Right Number

The phone number for GE Electronic Services is (708) 595-4343. The number given on page 72 of the April 1990 issue is incorrect. GE Electronic Services is listed in the lower right box, "Independent Kenwood Service Center Specialties," in the "Kenwood Corporation Service" article.

that everyone else had spent the entire time searching the forest on the grounds of Fort Harrison, feeling sure the fox had hidden there. That was an easy error to make since the sly one was only about three hundred yards to their northwest. The multipath caused by the trees had done just what the fox had hoped for. Everyone was told to pack up and go home for the day.

We did, but with great disappointment, since we had planned to bask in the limelight. Of course, the old pro lost-in-the-woods hunters were very disappointed, too. Talk about frustration!

The result of all these hunts over the years is that we have a strong core of about a dozen hunters who are at almost every hunt. Even in January and February we commonly have eight to ten people show up ready to go. Not only have we had fun all this time, we've also solved some serious interference problems.

Any Time

Now about this support group I have joined. There is a very definite cluster of hams here who are also, without question, foxhunt junkies. These people are: Tom N9DZJ, Paul W9DUU, Bernie KB9AWS, Larry WB9YAJ, Keenan N9HCK, Mike WA9FDO, Kevin N9FWB, and myself, N9FHF, along with maybe one or two more who will go foxhunting at the drop of a frequency. Not only on scheduled, monthly games, but also on frequent, impromptu games sometimes held as often as several times a month.

Impromptu foxhunts are usually held at night, starting around 10 p.m. to midnight. One of the group might put out a CQ FOX HUNTERS call, then tell us he has hidden and to come find him. Or, maybe, in a QSO someone will urge another to be the fox for that night. If neither of those happenings occur, two or three persons will search various bands with a scanner. If a problem frequency can be found, or just one that seems interesting, someone might ask, "Where do you suppose that signal is coming from?" Often, after discussing it a few minutes, the hunt is on.

There is much diversity in both our group of junkies and our regular folk. Backgrounds include lawyer, salesman, electronic tech, TV station engineers, toolmaker, real estate agent, home inspector, disabled, retired, to name a few. Equipment types range from small signal strength meters to buzz boxes, left/right boxes—mostly those of Paul Bohrer W9DUU design—to Doppler boxes and beam antennas. Several of us are now using marine direction finders along with other tools of the trade. Hidden transmitters have been almost everything from 100 mW oscillators to 100 W, or more, amplifiers. Distance traveled by those in our group during a hunt has been as little as a few miles to as many as 450 miles. The group has hunted and found transmitters as far away from Indianapolis as the Kansas City area, as well as in southern Indiana, northern Kentucky, and western Ohio.

Over the past two years we have gotten excited about tracking "bring 'em back alive" weather balloons carrying ATV equipment, including a video camera. It's just like what they say about the rest of the hobby—"something for everybody."

Are you having a hunt in your area soon? Let us know. We would like to join you. But then, if you're as addicted as we are, you would rather join us. Wouldn't you? Let's talk about it.

Clifford F. Vaught N9FHF may be reached at 5350 Kilmer Lane, Indianapolis IN 46250.

Number 23 on your Feedback card

ASK KABOOM

The Tech Answer Man

Michael Geier KB1UM
PO Box 64766
S. Burlington VT 05406

Getting "Hooked Up" Right

Have you ever had an equipment problem, but when you sent the rig in for repair, the shop claimed there was nothing wrong with it? Ever pulled a malfunctioning radio from your car only to have it work fine on the bench? Worse yet, have you ever moved a rig from one corner of the room to the other, only to find its behavior markedly different? If any of these things has happened to you, then you know what frustration is! What makes equipment act differently from one location to another?

Machines are somewhat like living things—they interact with, and are really inseparable from, their environments. A metal box is a metal box, and it should work the same wherever you put it, right? Not so fast. What about temperature? What about invading magnetic and electromagnetic fields? And especially, what about all those plugs and cables linking the box to all the other boxes?

The way your equipment is "hooked up" can greatly influence its performance, and often does for the worse. Sure, we all know about RF feedback getting into the mike cable, but the issue is much broader than that. If you're like most of us, you have lots of interconnected gear, like HF and VHF rigs, TNC, computer, amplifier, etc. And you may have found your station's performance deteriorating with each added cable.

RF Feedback

The biggest interconnection problem we amateurs face is getting all the equipment to work together without getting RF feedback. Not only can RF get in directly from the transmitting antenna, but it can emanate from the chassis of the radio as well. That happens because the chassis is one half (ground) of the circuit going to the antenna. It helps if you've got a good station ground, but even that is not a sure-fire cure.

The mike input is sensitive to very low voltage levels. It has to be, because microphones don't put out much. Unfortunately, audio amplifiers, especially today's solid state types, can act as diode detectors, because transistor junctions are essentially diodes. So, you've got a sensitive input driving a powerful output (your transmitter). Sure sounds like a feedback loop to me!

I have received a number of questions regarding the proper matching of microphones and rigs. The most important characteristic is the impedance of both the mike and rig. If there's a significant mismatch, the hookup will be very susceptible to RF. It is also likely to sound lousy. So always match the rig with a mike of the same approximate impedance. Most modern radios are designed to use low-impedance mikes of around 600 ohms. These can be dynamics or electrets, but never crystal or ceramic mikes unless they include a matching transformer.

Tube rigs, the kind with all tubes (as opposed to just driver and finals), are usually just the other way around. They require high-impedance mikes, and work best with crystal or ceramic units.

Some rigs, such as late-model Kenwoods, use two ground wires in their mike connectors. One goes to the chassis, and is used for the PTT function. The other is the shield of the mike cable, and goes directly to the ground on the mike amplifier board. This technique helps avoid stray RF by keeping chassis currents away from the mike amp, and defeating it by connecting the grounds together is just asking for trouble.

Other Inputs

Most likely, the mike is not your radio's only input. If you have a RTTY terminal unit, TNC, SSTV converter, or any other gadget connected, it too can be a source of trouble. It is very important to use shielded cable for *anything* that feeds signals to your rig. Even if the unit connects in the back of the radio at an auxiliary jack, it must use shielded cable.

It is also wise to use it for signals exiting the radio. You may have an external speaker, or, of course, be feeding audio to the RTTY or packet unit for receive. You may think you don't care what hits those connection wires in transmit (after all, you only use them for receive), but in fact they can be the paths for induced RF even when not in use.

Lead Dress

If you've got an RF feedback problem, take a look at the positions of the various wires, especially with respect to the antenna coax. Sometimes, just moving them a few inches apart will cure the problem. This particularly seems true when high power is involved. I remember one setup where I had terrible feedback with the linear amplifier on the left side of the rig, but not when it was on the right! (And yes, I had a decent ground.) It turned out that the amp's output coax, which crossed behind the radio, was just too darned close. With the amp on the right, the cable was nowhere near the rig.

Power Supplies?

Yes, their output wires can be trouble, too. This problem seems to show up more at VHF than at HF, and especially with "brick" amplifiers. The wires can resonate at 2 meters, 220 or 440 MHz, and the usual symptom is bad hum on the audio. Although it's often not practical to shield the wires, you can wrap them through a toroid just behind the rig, and that may fix it. Also, keep brick amps away from both the power supply and radio, as either can cause problems.

If you use a switching power supply, be sure to keep its output wires as short as possible. Switching supplies are more sensitive to high-frequency signals being induced through their leads than are linear types. Also, some switchers go nuts with long leads, even in the absence of external fields. The leads' inductance upsets the action of the chopping regulator.

Making Connections

The jacks on your rig are their most vulnerable points. Connect DC power backwards or short the wrong pins while testing, and you can do some real damage. It's wise to avoid soldering anything while it is connected to the radio. Pull it first, then check for errors before you plug it back in and power it all up.

Some of the sloppiest work I've ever seen has been on connectors, particularly audio plugs. If you short your speaker output, you will likely blow the audio amp IC or output transistors. If your mike plug, which can get heavily stressed in mobile applications, should short, problems can range from an inability to key the rig to no audio to circuit damage. Don't use cellophane or masking tape, and *never* count on unsoldered, twisted-together wires. Solder the connections properly, and if electrical tape is called for, use the real thing. Also, consider using heat-shrink tubing; it's neater and doesn't unravel and leave a sticky mess like tape usually does.

One handy way to insulate connections and also provide a bit of strain relief is to use hot melt glue. Glue guns are cheap, and if you do any wiring or fabricating on a regular basis, you should have one. The "glue" is really thermoplastic, and it forms around nearly anything and dries as fast as it can cool. If you squirt it into an audio plug, you know that plug is *forever*. You probably won't be able to get it apart, even if you want to. The glue peels easily, though, from most flat surfaces.

Serial Ports of Call

If you have a computer or TNC in your shack, it's almost certainly connected to something via a serial cable. Many of these are unshielded. If you get computer hash in the receiver, or continue to have RF feedback despite your best efforts, the computer cable may be the culprit. Try wrapping it in aluminum foil and using an alligator clip to connect the foil to ground (because, alas, you can't solder to aluminum). It's not the world's greatest shield, but it's a heck of a lot better than nothing. Also, try wrapping the cable through toroids at each end. That may reduce the problem, particularly at VHF and UHF.

When soldering connectors with multiple wires and pins, be careful not to overheat the wires, or the insulation can crawl up the wire, leaving bare conductor. A few of these near each other can spell disaster. Never count on space alone to keep wires apart; they have a nasty habit of inching toward each other in the dark, when no one's looking. Again, hot melt glue is a great way to avoid trouble.

Wiring power supply connectors requires extra care, because a short can mean lots of amps and maybe even fire. At the least, you'll probably blow the supply's fuse. In heavy-current applications, be sure to use big enough wire. Don't try to run a 20-amp HF mobile rig on #18 hookup wire! Such small wire has too much resistance, and will dissipate its voltage drop as heat. Sometimes it can get hot enough to melt its own insulation. I once saw a 12-inch clip lead wire glow red and burn up when accidentally connected directly across a 2-amp gell cell VCR battery. Ouch!

For the same reason, don't try to run high-current radios from a cigarette lighter plug. I tried it with an HF rig once, and midway through a transmission, the tip of the plug got so hot that it began to melt the plastic plug. The olfactory warning got me off the air in a hurry.

Due to their inherently poor design, PL-259 connectors are a real pain to solder. We all have our favorite methods of doing the shields, and some work better than others. As a rule, though, you need lots of heat. No 30-watt irons here. Break out the big gun, or consider using a small torch. The other big problem with these plugs is that when you get them hot enough to solder the shield, they often melt through the center conductor, causing a direct short. There's no easy way around this. Just try to hold the cable so that the center wire doesn't contact the plug body. Also, if your shield soldering method allows it, use a heat sink on the shield, between where you solder it and the rest of the coax. Clamped forceps or tightly-held needle-nose pliers will work fine.

Well, I could go on and on about this sort of thing, and it may seem like this column has been a series of "don'ts." But if you take care in the connecting and placement of your equipment, you will find that getting it all hooked up correctly can often save you from having to get it fixed.

See you next month, and keep those cards and letters coming. 73

Number 24 on your Feedback card

NEW PRODUCTS

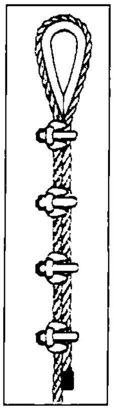
Compiled by Hope Currier

PRODUCT OF THE MONTH

WALKER SCIENTIFIC INC.

Walker Scientific Inc. has announced a new monitor for measuring potentially-hazardous low-level electromagnetic field radiation and getting accurate readings on a digital display. The ELF-50D Field Monitor is a hand-held instrument that accurately measures the extra-low-frequency (ELF) electromagnetic radiation generated from power lines, TVs, video displays, home appliances and other equipment. Just switch it on and hold it where radiation is suspected and the reading will instantly show on a 3½ digit LCD display. It is calibrated to measure the electromagnetic radiation generated from any 50 Hz or 60 Hz device with ±1% accuracy and has two switch-selectable measurement ranges: a low range from one milligauss to two gauss, and a high range up to 20.0 gauss. Calibration is traceable to NIST (previously NBS). The instrument is pocket-sized and powered by a 9 volt alkaline battery.

The ELF-50D sells for $225 (list). For more information contact *Walker Scientific Inc., Rockdale St., Worcester MA 01606. (508) 852-3674, (800) 962-4638, FAX (508) 856-9931.* Or circle Reader Service No. 201.

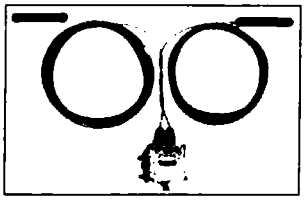


PHILLYSTRAN

The HPTG "I" from Phillystran is a field-installable non-metallic guy system manufactured from high strength, low stretch Kevlar™ fiber. This new version of the HPTG products is designed to assure dependable performance with field-installable wire rope clips. It is priced about the same as the original product because the potting compound and sockets have been replaced with inexpensive wire rope clips.

For more details and price information contact *Phillystran, United Ropeworks (U.S.A.) Inc., 151 Commerce Drive, Montgomeryville PA 18936. (215) 368-6611; FAX (215) 362-7956.* Or circle Reader Service No. 204.

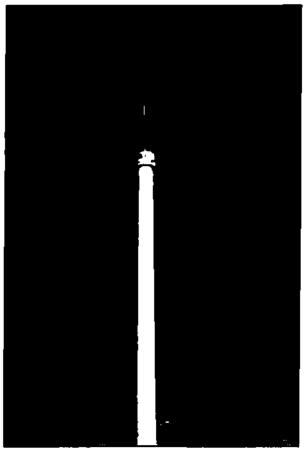
POYNTEK ASSOCIATES



Poyntek Associates has announced a family of wideband monopole (vertical) antennas for the high fractional bandwidth, low HF amateur bands, eliminating the need for antenna tuners and special radiator networks. Snyder Full-Band™ wideband antennas for the 40, 75/80 and 160 meter bands are designed to allow maximum use of modern broad frequency range continuous or digital tuned transceivers and "no tune" power amps to 1.5 kW PEP output. The three models (VFB-40X, VFB-75/80X and VFB-160X) are constructed of high quality, high insulation resistance space-age plastics and high conductivity, corrosion-resistant non-ferrous metals to provide low weight, low wind drag, and weather endurance for years. They also include optimized feed modules for a broad range of ground radial system sizes and ground characteristics. These antennas are modular for user assembly and installation.

Model VFB-40X is priced at $210, VFB-75/80 is $250 and VFB-160X is $350. Contact *Poyntek Associates, P.O. Box 741, Placentia CA 92670. (714) 993-7525.* Or circle Reader Service No. 202.

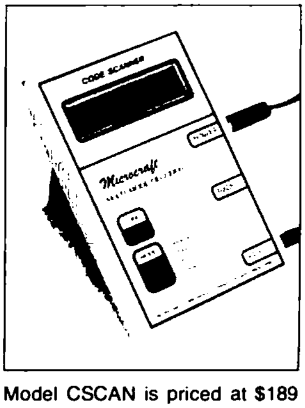
CELLULAR SECURITY GROUP



Thomas Bernie KØTB/1 has announced an adaptation to ground plane antennas, constructed by attaching elements to SO-239 connectors: the MAX System antennas. These antennas are built according to Handbook dimensions by soldering stainless steel elements directly to a connector placed inside a precision-drilled one-inch PVC cap. This design results in a simple, rugged, weatherproof antenna at a reasonable price. The antennas are shipped fully assembled with instructions and a six-inch PVC mounting mast. All the user has to do is connect the coax and mount the antenna.

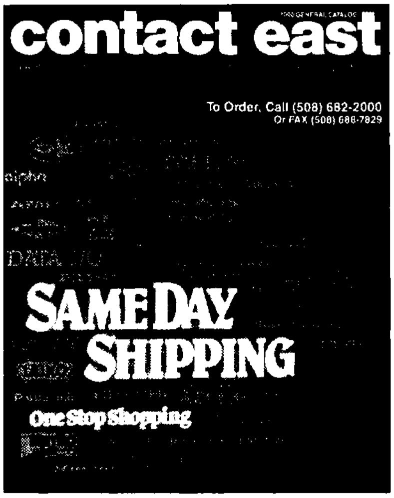
The MAX146, MAX220 and MAX440 are priced at $29.95 each, with free shipping and handling and a money-back, "no time limit" guarantee. Optional Type N connectors or 38-inch mounting masts are available for $5.00 each. Contact *Cellular Security Group, 4 Gerring Road, Gloucester MA 01930. (508) 281-8892.* Or circle Reader Service No. 203.

MICROCRAFT



Microcraft Corporation has introduced CODE SCANNER, a new advanced two-line 32-character multimode decoder that copies Morse, Baudot and ASCII codes from your radio. CODE SCANNER features a built-in code practice oscillator for hand key with readout to the display, a built-in speaker, advanced analog and digital filtering with AGC, and a special practice mode for learning the Morse characters. The CODE SCANNER is compact (3½" x 5¾"). It operates from 12 VDC or 120 VAC with the adapter provided. Hook-up to a radio speaker or headphone jack is easy.

The price for CODE SCANNER Model CSCAN is priced at $189 plus $5 S & H. Contact *Microcraft Corporation, P.O. Box 513, Thiensville WI 53092. (414) 241-8144.* Or circle Reader Service No. 206.

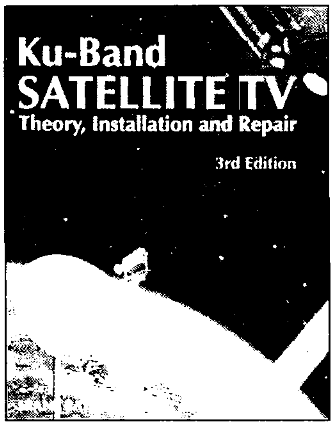


CONTACT EAST

The new *1990 General Catalog* from Contact East is a complete sourcebook of products for testing, repairing and assembling electronic equipment. This 148-page book contains products for engineers, managers and technicians and introduces many new oscilloscopes, static protection products, soldering supplies and stations, test equipment, precision hand tools, plus Contact East's exclusive line of tool kits. It also features expanded lines of voice/datacommunication test instruments, wire and cable aids, electronic adhesives, magnifiers, and inspection equipment. The catalog describes all products in detail and includes specifications, full color photos and prices. Purchases come with an ironclad guarantee. Contact East's "Same Day Shipment" policy ensures fast delivery; orders received by 4 p.m. are shipped by 5 p.m.

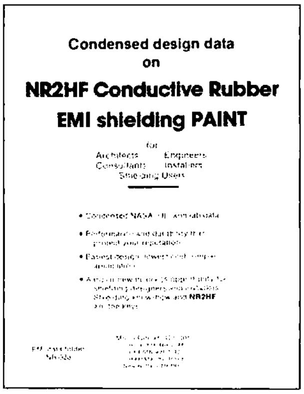
There is no charge for this catalog. For more information call *(508) 682-2000* or write to *Contact East, 335 Willow St., No. Andover MA 01845.* Or circle Reader Service No. 205.

BAYLIN PUBLICATIONS



Baylin Publications has announced the release of the third international edition of *Ku-Band Satellite TV—Theory, Installation and Repair* by Frank Baylin and Brent Gale, with technical contributions by John McCormac. This comprehensive source of information and explanations covering all aspects of worldwide Ku-band satellite television systems has been extensively revised and expanded in scope. The 40 pages of new information covers European DBS satellite TV, flat plate antennas, LNB and satellite receiver electronic design, worldwide scrambling technologies, link analysis, fixed antenna installations, interfacing receivers and decoders, and instructions for aligning a polar mount without a compass.

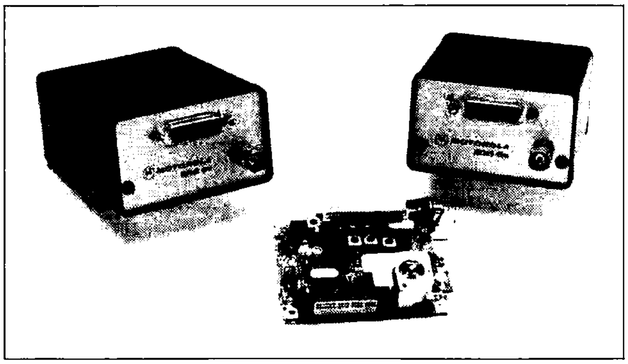
This 8½" x 11" 432-page manual contains over 400 up-to-date photographs and illustrations. It is available from *Baylin Publications, 1905 Mariposa, Boulder CO 80302* for $29.95 plus $2 S & H. For more information circle Reader Service number 207.



MICRO-CIRCUITS CO.

Micro-Circuits Co., Inc. is offering, at no charge, a new electronic shielding design kit for consultants, business owners and home owners. The NR 02a design kit shows how to use low cost NR2HF rubber paint shielding to prevent the rising tide of electrical interference from causing unreliable performance by computer, medical, security, recording and communications equipment. Unlike conventional electronic shielding which is far too costly and wasteful of space for most businesses and homes, the NR2HF rubber paint shielding is easy to apply. It has been widely used in industry for more than five years and in the space program for two years.

To request the NR 02a kit contact *Micro-Circuits Co., Inc., 10800 Maudlin Road, New Buffalo MI 49117. FAX (616) 469-2742.* Or circle Reader Service No. 208.



MOTOROLA INC.

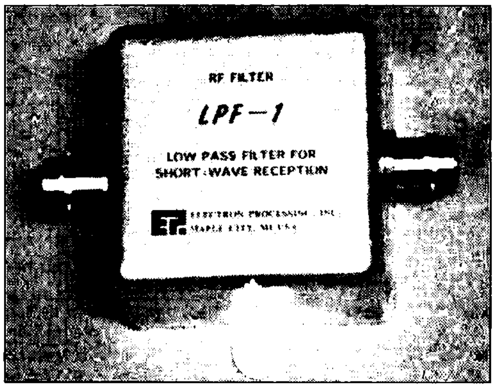
Motorola Inc.'s Radius Division has introduced the RNet 150 and 450 series of telemetry radios operational on the UHF and VHF frequency bands (403–430 MHz, 450–470 MHz and 136–174 MHz). These models are available on two-channel operation. They measure 3.3" (L) x 1.52" (W) x 2.70" (H) and weigh just 10.2 ounces. Other key features include low current drain, voice and data transmission capability, and variable power levels.

For prices and information contact *Motorola Inc., Communications Sector, Public Relations Department, 1301 E. Algonquin Rd., Schaumburg IL 60196. (800) 624-8999, ext. 5992.* Or circle Reader Service No. 210.

ELECTRON PROCESSING

Electron Processing, Inc. has announced a new filter that eliminates interference to shortwave reception caused by strong VHF/UHF signals. The LPF-1 effectively reduces signals from TV, FM and two-way radio stations from the antenna line of any shortwave receiver. It is designed to connect in the antenna lead between your antenna and receiver, and filter out signals on all frequencies above 50 MHz. Signals in the FM broadcast band are reduced at least 100 times in strength, yet signals below 30 MHz are virtually unaffected. This filter uses a two-stage low-pass filter network which requires no power to operate. The unit is housed in a compact 2" x 2" x 1" rugged metal enclosure with BNC female connectors provided for easy connection in your antenna system.

The LPF-1 is priced at $19.95. Contact *Electron Processing, Inc., P.O. Box 68, Cedar MI 49621. (616) 228-7020.* Or circle Reader Service No. 209.



Number 25 on your Feedback card

PACKET TALK

Latest in Digital Hamming

Brian Lloyd WB6RQN
124 Churchill Avenue
Palo Alto CA 94301
WB6RQN K3MC

About the Mail

I have been getting quite a bit of mail these days. I want to thank all who have written. I try to answer your letters, especially those that come with self-addressed, stamped envelopes. However, I do have a bad habit; I tend to let the letters stack up until the stack threatens to engulf the top of my desk/workbench, so forgive me if you do not get a response for a month or so.

You may notice that I have included my BBS address and my Internet address along with my US Postal Service address. I encourage you to use electronic mail to reach me. I tend to respond to my electronic mail the moment that I receive it so you are likely to get an answer very quickly. For those of you who use CompuServe, I am sorry to say I no longer use CompuServe. It simply costs too much, and since CompuServe now offers electronic mail service to the Internet, you can reach me that way.

Responses to the April Column

Back in April I wrote on the rather slothful state of affairs in US amateur packet radio. I have received a number of communications regarding that column. Surprisingly, they have been overwhelmingly positive. I did get one somewhat negative letter from Joe G3ZCZ (G3ZCZ @ N4QQ).

Joe writes: "Brian, about your packet editorial, stop moaning and make some constructive suggestions. There are 3 main problem areas: 1) The lack of applications, although people are beginning to bring up new servers; 2) the present system's inertia—you can't do something new because the system doesn't support it; and 3) the user interface. People who don't know the difference between 'converse' and 'command' are given a choice of 100 different commands [in their TNCs]. It scares them off."

I tend to disagree with Joe that I am moaning and not making constructive suggestions. I have been making constructive suggestions for quite some time now; in fact, for the better part of a decade. I write this column, I write articles, I talk at radio club meetings, I help other hams construct their stations, and I help build and maintain the packet radio facilities where I live. I tend to consider myself as a doer rather than a casual bystander. I helped construct and maintain the first relatively large TCP/IP-based packet radio network in the Washington, DC, area. All-in-all, I think that I have more than paid my dues to the packet radio community.

Joe's other points are well taken. His first point, lack of applications, is significant. How many times have you demonstrated packet radio only to be asked, "But what is it good for?" Did you find yourself with no good answer? I know that I certainly have on occasion. I do like to point out packet radio's usefulness for the National Traffic System, the DX packet cluster, and moving health and welfare information during times of crisis. The BBS has made unattended electronic mail possible for thousands of hams. How many of you have scheduled HF QSOs via packet radio? It even works for many DX stations.

All this is well and good, but you may note that it doesn't include any real-time applications. Packet radio today tends to be rather like the tortoise from the old fable; slow and steady wins the race. To make new real-time applications like digital voice, digital video, and computer file servers possible we are going to need much faster radios and modems. In the meantime, what ideas do you have for new applications? Send them along and I will publish them.

Joe's second point is also very significant. There tends to be a good deal of inertia when it comes to new ideas. There have been hams who have tried to accuse me of trying to ruin packet radio for "legitimate users" by running TCP/IP. Gee, if people like that would spend half as much time and effort working to improve packet radio as they do complaining, we would have a much better packet radio network (HI).

Personally, I think that most of the inertia centers on education. Hams traditionally have striven to learn and master new technologies. If you have knowledge, perhaps you could go out and talk about some aspect of packet radio that interests you. Perhaps you could even put together a small group interested in experimenting with some new technology or application for packet radio.

Joe's last point disturbs me. He implies that the command set in the TNC is difficult to learn and that packet radio should somehow be made simpler. Well, there is definitely a place in this world for newer and better software for packet radio operation. On the other hand, I think that most hams can handle learning how their TNC works.

I am afraid for amateur radio when I hear people talking about how difficult amateur radio is, and how we must make it simpler so more people can enjoy it. Hogwash! Amateur radio is a technical hobby. Amateur radio is where people who are interested in radio technology go to engage in their interest. You have to learn new things to be a part of amateur radio. If you are willing to learn, there are MANY hams out there willing to teach. It will probably cost you no more than the cost of gas to get to a club meeting or perhaps lunch when they come over to your house to help you set up your station. After that you can share your newly acquired knowledge by helping someone else learn something new.

I want to thank Joe for his well thought out letter. He also included a program for the PC which I haven't had a chance to try yet. When I do, I'll let you know how it turns out.

The TAPR PacketRADIO

At Dayton in 1989 TAPR showed off their proposed PacketRADIO. PacketRADIO is going to be a kit that combines both the TNC and a 2m transceiver in one package. The nice thing about the PacketRADIO is that it will provide both 1200 and 9600 baud capability. The PacketRADIO will be a kit along the lines of the original TAPR TNC.

TAPR has had quite a time getting the PacketRADIO done and into the hands of amateurs. At Dayton last year I signed up to be a beta tester. This means that if they choose to use me I will receive one of the early kits, which I am obliged to construct and use so that I can provide feedback to TAPR. With feedback, they can possibly improve the production version. The TAPR PacketRADIO is a significant step toward better and faster packet radio.

I will keep you posted on the PacketRADIO saga. If you want more information on PacketRADIO, or if you want to join TAPR, write to: Tucson Amateur Packet Radio, PO Box 12925, Tucson AZ 85732, or call (602) 323-1710. I am sure that they would be glad to hear from you.

The Hint Department

The other day I put up a new antenna, so I was checking to see what I could hear. I noticed a ham spending quite some time perusing the local BBS. While he was doing that, a number of other stations attempted to connect but couldn't because the BBS was busy. This prompted me to share my technique for getting on and off the BBS in as little time as possible.

The process that I use involves doing most of the work off-line, e.g., while I am not connected to the BBS. First I turn on a capture file in my terminal program. This causes everything that comes in from the TNC to be stored in a disk file on my PC. Next I connect to the BBS and give the RM (read mine) command to get all my mail. I then use the L (list) command so that I can see all the bulletins that have come in since the last time I connected to the BBS. As soon as the BBS has transmitted my mail and the list of messages/bulletins, I disconnect from the BBS so that others can use it.

Now I take all the time I want to read my mail, and I prepare answers in another file complete with all the commands to enter and send the mail. If I got a letter from W6ABC @ WB6XYZ and from KA3ZZ @ KA9Q I would enter something like the following into my send file:

```
sp w6abc @ wb6xyz
new software
Thanks for your note. I will include
your suggested feature in the new
software.
73 de Brian, WB6RQN @ K3MC
/ex
sp ka3zz @ ka9q
meeting
Thanks for reminding me of the
meeting. I will see you there.
73 de Brian, WB6RQN @ K3MC
/ex
b
```

Now I connect to the BBS again and use the file transmission feature of my terminal program to upload my send file to the BBS. You will note that the file contains all of the commands to send the mail (the 'sp' or 'send private' commands) and to disconnect from the BBS again (the 'b' or 'bye' command). This ensures that I will be connected to the BBS for the shortest time possible.

To read the bulletins, I use a similar technique. Let us assume that I want to read messages (bulletins) 1924, 1927, and 1939. I prepare a send file containing the commands to read the desired messages like this:

```
r 1924
r 1927
r 1939
```

Then I connect to the BBS, transmit the read commands, and open a capture file to store the bulletins.

Note that the 'b' (bye) command is not included here. If you include it, you will lose part of the last message—the BBS closes the connection as soon as it receives the 'b' command. It doesn't wait until all of the message has been transmitted.

Try this technique out for yourself. You will find that you end up spending less time connected to the BBS. If everyone does this, the BBSs can support more users. ■

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the June issue, we should receive it by March 31. Provide a clear, concise summary of the essential details about your Special Event.

JUN 30-JUL 1

WESTON WV The West Virginia State Convention, sponsored by the West Virginia State AR Council, will be held at the Jackson's Mill State 4-H Camp near Weston. Doors open Friday for dealer set-up from 5:30 PM-11 PM and open to the public at 9 AM Saturday and Sunday. Admission is $5. Flea market tables free. Ticket required. Equipment auction Saturday evening. VE exams 8 AM Saturday. Pre-registration required. Deadline June 23. Contact *Bob Robinson KU8C, 304-366-0132.* Camping available. Talk-in: 144.79/145.39. For advance tickets contact *Sue Goodwin N8JNL, 103 Cleveland Ave., Nitro WV 25143.* For info, contact *Chuck McClain K8UQY, 304-366-5401.*

JUL 1

WILKES-BARRE PA The Murgas ARC will hold its annual Ham/Computerfest at the ICE-A-RAMA Coal St. Sports Complex. Set-up 6 AM. General admission 8 AM. Advance tickets $3, $4 at opening. XYLs and children under 16 free. Tailgating $3. Free parking. Indoor tables $10. Reserved space will be held until 0830 unless paid for in advance. Bring your own extension cord. Talk-in: 53.81, 53.61, 146.52, 146.61, 444.825, 10 GHz. To register for FCC exams write: *Joe Caffrey W3DZH, 79 Kellers Lane, Plymouth PA 18651.* For info contact *K3SAE-KB3GB, Rd. 1 Box 214, Pittston PA 18643. 717-388-6863.*

JUL 4

HARRISBURG PA The Harrisburg RAC will sponsor their July 4th Firecracker Hamfest at the Bressler Picnic Grounds. Set-up for vendors and tailgating at 6 AM. Opening at 8 AM. Admission $3, tailgating $3. Tickets in pavillion $10 in advance or $12 at the site. Talk-in: 147.30/.90 or 52/52 simplex. Contact *Dave Dormer KC3MG, 717-939-4957* for reservations

JUL 7

WEST DES MOINES IA The Des Moines Radio Amateur Assoc. will hold its 1990 Hamfest at the Sacred Heart School. Contact *Harold Ober NØHZK, 515-289-1330,* or write *Hamfest 90, Des Moines Radio Amateur Assoc., PO Box 88, Des Moines IA 50301.*

BURLINGTON ONTARIO The Ontario Hamfest '90 will be presented by the Burlington ARC at the Milton Fairgrounds starting at 9 AM. Set-up at 8 AM. Commercial vendors please use the North gate. Free flea market space. General admission: Adults $5, spouse $3, children under 12 years free; please use the south gate. Contact *Rick Jones VE3WRJ, 639-0724* or *Ted Barrette VE3TED, 639-5878.*

OAK CREEK WI The South Milwaukee ARC Inc. will sponsor Swapfest '90 at American Legion Post #434 from 7 AM-2 PM. Free overnight camping. Admission $4. Talk-in: 146.580 MHz FM simplex and most local repeater frequencies. Map and details from *The South Milwaukee ARC, PO Box 102, South Milwaukee WI 53172-0102.*

JUL 7-8

INDIANAPOLIS IN The Indianapolis Hamfest and Central Division AARL Convention will be held at the Marion County Fairgrounds. Advance tickets $6 with SASE. $8 at gate. Mail request for advance tickets to *Indianapolis Hamfest, PO Box 11776, Indianapolis IN 46201.* Free camping and hook-ups supplied on a first-come basis. Gates open at 6 AM each day. Commercial and inside flea market booths; plenty of outside flea market space.

JUL 8

DOWNERS GROVE IL The DuPage ARC is sponsoring the eighth annual Hamfest and Computer Mart at the American Legion Post #80, beginning at 8 AM. Dealers indoors, flea market and tailgating outside. Free parking. VEC exams. General admission $2 in advance, $3 at the gate. Talk-in: 146.52 - 600. For tickets and table reservations, SASE to *Hamfest Chairman, DuPage ARC, Edwin Weinstein WD9AYR, 7511 Walnut Ave., Woodridge IL 60517.* For info call *Ed, 708-985-0527 evenings.*

PITTSBURGH PA The North Hills ARC will hold its 5th Annual Hamfest at the Northland Public Library from 8 AM-4 PM. Free admission. Free dealer tailgating space. Free parking. Handicap facilities. VEC testing at 8 AM. For VEC info send SASE to *John Rosenwald NM3P, 400 Stevens Dr., Pittsburgh PA 15237. 412-931-2651.* Please pre-register. Send SASE for Hamfest info to *Bob Ferrey, Jr., N3DOK, 9821 Presidential Dr., Allison Park PA 15101. 412-367-2393.*

JUL 13-15

NORTH DAKOTA-MANITOBA North Dakota and Manitoba's biggest Hamfest will be held at the Peace Garden on the USA/Canadian border a few miles North of Dunseith ND, and a few miles south of Boissevain Manitoba. Registration will start Friday afternoon. Breakfast for all on Sunday morning. Outdoor flea market. Contact *John A. Swanke KAØSLI, Box 304, Lakota ND 58344.*

JUL 14

EAU CLAIRE WI The Eau Claire ARC will hold its annual Hamfest at the 4-H buildings behind Highland Mall from 8 AM-2 PM. Free parking. Tables $3, dealers $5. Admission $3. Packet meeting at 10:30. Exams from 9 AM-1 PM, all walk-ins. Talk-in on the Eau Clair 31/91 repeater. For table reservations contact *Liz Searing N9EQR, 1129 McKinley Rd., Eau Claire WI 54703. 715-834-1303.*

JUL 15

WASHINGTON MO The Zero Beaters ARC will hold its annual Hamfest at the Bernie H. Hillerman Park Washington Fairgrounds. Flea market parking $2 a space. Free admission. Walk-in VE exams begin at 10 AM. Talk-in: 147.24 repeater. Contact *Dane Brockmiller, Rt. 2 Box 623, Union MO 63084. 314-583-2323.*

LAKEWOOD CO The Denver Radio Club is holding its annual Hamfest and the ARRL Colorado State Convention at the Jefferson County Fairgrounds. Talk-in: 147.33/.93 and 146.52. Contact *Keith NØLSL at 303-680-0862 or 303-790-4001* or *John KA3RDZ at 303-340-8698 or (340)-980-2957*

AUGUSTA NJ The Sussex County ARC will Sponsor "SCARC '90" at the Sussex County Fairgrounds beginning at 8 AM. Registration, $4 (XYLs and harmonics free). Indoor tables $7. Tailgate space $5. Free parking. For further info contact *Don Stickle K2OX, 185 Weldon Rd., Lake Hopatchong NJ 07849. 201-663-0677.*

JUL 20

VERONA NY The Madison-Oneida ARC is holding VE exams at the Madison-Oneida BOCES beginning at 7 PM. Novice through Extra. Technician through Extra class tests cost $4.95. Talk-in: 145.37. Contact *Leonard Popyack WF2V. 315-853-8974.* WF2V can also be reached on *146.79, 145.37, WF2V @ WA2TVE, or POPYACK@TOPS20.RADC.AF.MIL.*

JUL 21

KNOXVILLE TN The RACK Volunteer Examiner Team is holding VEC exams at the Pellissippi State Technical Community College, Bldg. B, Room 129, beginning at 10 AM. To pre-register, send SASE and check for $4.95 to *WCARS/VEC, Ray Adams N4BAO, 4325 Felty Dr., Knoxville TN 37918.*

JUL 22

VAN WERT OH The Van Wert ARC Inc. will hold its 3rd annual Hamfest/Computer Show at the Van Wert County Fair Grounds. Free parking. Tables are $6 each (8' x 30"). Bring your own extension cords. Outside sales are as follows: One $4 permit entitles you to one vehicle and 10' frontage. Bring your own tables. Please contact *Bob Barnes WD8LPY, 419-238-1877* or *Jack Snyder WD8MLV, 419-495-2209.*

JUL 26-29

WICHITA KS The Central States VHF Society will hold its annual convention at the Marriott Hotel. Room reservations should be made directly with the hotel. For info contact *Lonnie Roberts WDØL, 628 Elaine, Clearwater KS 67026. 316-584-6465.*

JUL 28

GOWANDA NY The Tri-county ARS is holding its 2nd Annual Hamfest at the Gowanda American Legion Post #409, beginning at 7 PM. Admission $4 per person. Talk-in: 145.39 K2XZ repeater. Contact *Andy, 716-532-2250.*

JUL 29

TIMONIUM MD The BRATS Maryland Hamfest/Computer Fest will be held at the Maryland State Fairgrounds. Kids under 12 free. 8' tables with power access are $40 each or 4 for $150 in the Main Exhibit Hall. Tables in the Home Arts Building (no power) are $20 each or 8 for $150. Dealer set-up begins Saturday at 2 PM, Sunday at 6 AM. There is no set opening hour. Tailgating is $5 per vehicle space, for sale only on the day of the Hamfest. No advance reservations for tailgating. Free VE exams begin at 10 AM. Pre-registration required. Talk-in: 147.03/ı, 443.4/+, 224.96/–. For info and reservations write *BRATS, PO Box 5915, Baltimore MD 21208. 301-583-9147.*

PEOTONE IL The Hamfesters Radio Club will host its 56th Annual Hamfest at the Will County Fairgrounds from 6 AM-3 PM. Donation $4 advance, $5 at the gate. Children under 12 years free. Set-up is Saturday from 6 PM-12 midnight. Opening is at 6 AM Sunday. For advance tickets send SASE & check to: *Don Burch N9DWI, 8438 S. Kolin Ave., Chicago IL 60652. 312-582-9776.* Reservations close July 15th. Talk-in: 146.16/.76 CFMC repeater.

AUG 3-5

JACKSON HOLE WY The Eagle Rock ARC will sponsor the WIMU '90 Hamfest at the Virginian Lodge. Advance tickets $10, $12 at the door. Talk-in: 146.31/.91. Send registration to: *WIMU '90, PO Box 2415, Idaho Falls ID 83403-2415.* Make checks payable to WIMU '90. For info contact *Doug Smith WA7PYO 208-529-5121 days, 208-529-1504 evenings.* For reservations at Virginian Lodge *800-262-4999*; mention the Hamfest.

SPECIAL EVENT STATIONS

JUN 30

ALFRED NY Special Event Station W2RUI will be operated from the Artist Blacksmith's Assoc. of North America 1990 International Conference from 1400Z-2200Z. Frequencies: SSB 7.275, 14.275, 21.375 and 28.375. For certificate send QSL and large SASE to: *KA2LCR, 6562 Royal Parkway South, Lockport NY 14094.*

JUL 1

KOKOMO IN Special Event Station N9IPA will be operated from the Haynes-Apperson Automobile Festival between 1300-2100 UTC in celebration of the testing of the first commercially successful automobile by Elwood Haynes on July 4, 1894. Frequency: 28.450 MHz + QRM. Send a SASE with card and QSO number to: *Wildcat ARS, 1745 S. Indiana Ave., Kokomo IN 46902.*

JUL 7-8

KALAMAZOO MI The Kalamazoo ARC and the Southwest Michigan AR Team will operate Special Event Station W8VY from 1300Z-2200Z at the High On Kalamazoo Airshow to demonstrate amateur radio to the public. Frequencies: 10m and 2m. For a certificate, send QSL and SASE to *W8VY, c/o Jack Price KA8AOB, 1511 Center St., Kalamazoo MI 49001-1859.*

JUL 8-14

CATALINA ISLAND CA Special Event Station WA6OPZ will be operated from the Emerald Bay Boy Scout Camp from 1500-0700 UCT daily, to commemorate the Boy Scouts' use of Emerald Bay since 1925. Frequencies: 28.45, 14.30 and the General portion of the 15m and 40m phone bands. CW operation will be around 7125 kHz and 21150 kHz. Contacts send a QSL card and a 9x12 SASE to *Marshall Jacobson, 16441 Gilmore St., Van Nuys CA 91406,* for a certificate.

JUL 13-14

US/CANADIAN BORDER Special Event Station VE4IHF will be operating from the International Peace Garden from 9 AM-6 PM CST. Frequencies: 80m 3.941, 40m 7.255, 20m 14.255, 15m 21.365, 10m 28.355. We will be using the higher frequencies if they are open. For a Peace Garden certificate, send 2 IRC and an SASE to *Dave Snydal VE4XN, 25 Queens Crescent, Brandon, Manitoba Canada R7B 1G1.*

JUL 14

BELLE PLAINE MN The Soutwest Metro ARTS will operate WBØRMK from 1500Z-2100Z in celebration of B-B-Q days. Frequencies: 7.245, 14.245, 28.345. Send QSL and SASE to: *WAØCXW, Secretary of SMARTS, PO Box 144, Chaska MN 55318.*

JUL 14-15

ANAHEIM CA The Disneyland ARC will operate Station N6MM from 1600Z-1400Z in celebration of its 35th year as the world's premier theme park. Frequencies (+QRM): 20m 14.260, 15m 21.335, 10m 28.450, 2m 146.94 (Disneyland repeater). For a special QSL card send QSL card with QSO number and one first class postage stamp for the return card to *Disneyland ARC, PO Box 3232, Anaheim CA 92803.* For more info contact *John Thompson K6OHM, 714-520-2240.*

JUL 21-22

PICO RIVERA CA The Northrop Radio Clubs at Pico Rivera and Hawthorne, W6VPZ/6 and W6VPZ, will operate 24 hours from 1100 PST 21 July-1100 PST 22 July, to celebrate the anniversary of the first flight of the B-2 Advanced Technology Bomber and the 51st year of Northrop's building airplanes. Frequencies: 25 kHz from the lower band edges of the Novice and General bands (10, 15, 20, 40, and 80) and 1.920. For QSL send to *Northrop Radio Club W6VPZ/6, 8900 E. Washington Blvd., Pico Rivera CA 90660, and Northrop Radio W6VPZ, One Northrop Ave., Hawthorne CA 90250.*

JUL 24

CASPER WY The Casper ARC will operate Station W7VNJ from 1500Z-2300Z to commemorate the Wyoming Centennial Celebration. Frequencies: 14.300, 21.300, and 28.400 (+QRM). For a centennial QSL please send a SASE to: *Casper ARC, PO Box 2802, Casper WY 82602.*

JUL 27-29

WESTOVER AFB MA The Mount Tom ARA will operate WA1KGR between 1300Z-2000Z, during the Open House, to commemorate the 50th Anniversary of the base in Chicopee MA. Frequencies: 28.425 MHz and local 2 meter packet. For QSL card and certificate send a #10 SASE with QSL card and contact # to *WA1KGR, PO Box 2, Westover AFB MA 01022-5000.*

GILROY CA The Gabilan ARC will operate Station KG6GF from 1600-2400 UTC to commemorate the 12th Annual Gilroy Garlic Festival. Frequencies: 14.260, 21.360, and 28.360. For a certificate and QSL card send SASE to *GARC, PO Box 2178, Gilroy CA 95021-2178.*

JUL 28

HOBBS NM The New Mexico Dist. Royal Rangers will operate Station KD5RZ from 1300-0100 UTC. Frequencies: 3.870, 7.250, 14.250, 21.320 and 28.520/28.380. For certificate send QSL and large SASE to: *KD5RZ, c/o 2214 Thomas, Hobbs NM 88240.*

JUL 28-29

AURORA CO The Colorado Six Meter Invitational Net is sponsoring an Activity Day Contest from 1400Z July 28-0300Z July 29. Make contacts on 50MHz, exchanging callsign, first name, grid square and S.I.N. number (if any). S.I.N. members count for 3 points, non members for 2 points. For score, multiply number of grid worked by number of points logged. First and second place winners will receive certificates. All contest operators sending in their scores will receive results of the scoring. Send logs, including date and time of QSOs along with SASE by Aug. 31 to: *Clay Schneider KAØMKF, 1034 S Ventura Way, Aurora CO 80017.*

JUL 28-31

OSHKOSH WI The Fox Cities ARC will operate Special Event Station W9ZL from the 38th Annual International Experimental Aircraft Assoc. Fly-In & Convention, primarily during daylight hours. Frequencies: General portions of the 10, 15, 20 and 40m bands in as many modes as possible. All QSLs must include contact numbers. Special certificates will be issued for proper OSLs. Send 8x10 SASE to: *Wayne Pennings WD9FLJ, 913 N. Mason St., Appleton WI 54914.*

JUL 30-AUG 3

CANTON OH The Canton ARC will operate Station W8AL from 2200-0200 UTC July 30-August 3, and from 1700-2300 UTC on Aug 4-5, to celebrate the Pro-Football Hall of Fame Greatest Weekend. Frequencies: SSB 28.350, 21.350, 14.270, and 7.270; CW 28.150, 21.060, 14.060, and 7.060. RTTY, packet, AMTOR, and 2 meter FM operation also. SWLs welcome. For an unfolded certificate, send your QSL and a 9x12 SASE with 2 units of first class postage. For a QSL or folded certificate, send your QSL and a #10 (business size) SASE to: *Randy Phelps KD8JN, 1226 Delverne Ave. SW, Canton OH 44710-1306.*

JUL 30-AUG 4

GRAND HAVEN MI In conjunction with the 1990 Coast Guard Festival, commemorating the 200th Anniversary of the Coast Guard, the North Ottawa ARC will operate KE8DL from 1500Z-2300Z. Frequencies: lower 25 kHz of 40m and 20m and between 28.400 to 28.450. Contact any NOARC member during the week and those contacts will also be recognized. For certificate send QSL and #10 SASE to: *KE8DL, 1815 Hillcrest, Grand Haven MI 49417.*

AUG 1-4

WILDWOOD NJ The U.S. Coast Guard Electronics Engineering Center, in cooperation with the Cape May County ARC, will operate Station K2CGD to celebrate the 200th anniversary of the Coast Guard's founding, from 2000Z-2359Z on Aug 1st-3rd and from 1200Z-2359Z on Aug. 4th. Frequencies: Phone 28.375, 21.375, 14.300, 7.235 and 3.875; CW 21.175, 14.100, 7.110, 3.710. For a QSL and certificate send a 9x12 SASE and QSL to *K2CGD, USCG EECEN, PO Box 60, Wildwood NJ 08260.*

Number 27 on your Feedback card

ABOVE AND BEYOND

VHF and Above Operation

C.L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake
San Diego California 92119

Switching Power Supplies

This year the Southwest Division ARRL Convention is being held in the San Diego area on August 26, at the Town and Country Convention Center very near my home. The San Diego Microwave Group will participate in the assembly of a "VHF through Light" session organized by Kerry Banke N6IZW and Ed Munn W6OYJ. Papers and demonstrations on 144 MHz through Laser, or blue light frequencies, are being sought for the convention presentation.

Ed expects that most attendees will already be interested in VHF to microwave operations. However, because the audience will have diverse interests, we don't want to get wrapped up in equations when proposing topics for technical discussion. Informative topics describing various aspects of our amateur spectrum and its uses would be helpful in describing the microwave spectrum.

I can't wait for the convention to start. Being a surplus scrounger, the flea market is my opportunity to check out bargains and find new items for projects. Meeting old acquaintances I haven't seen in a long time will also be very enjoyable. Any time you can mix a ham convention, old friends, and surplus scrounging it has got to be a happening. In any case, the convention should be so full of activities and varied interests, you don't want to miss out. See you at the flea market or on the grounds.

FETs

Lately surplus scrounging in the San Diego Area has turned up a large quantity of high power enhancement mode HEXFETs™ (International Rectifier Corp.). This surprised me since they are a recent development. Usually when you locate items like these, they're just a few devices on a PC board, not a bag full.

FETs, field-effect transistors, have been around for a long time, but devices capable of handling high power, being relatively new, are not common in the surplus market. They're primarily used in switching power supplies and control circuitry. When first introduced, the cost per FET was quite high; now they are less than $10 each.

The power FETs are quite special, representing a technological jump in high speed switching components. What makes the power FET so superior to a power transistor is that it does not need gate current to drive the device. The gate structure, insulated from the drain and source, looks like a capacitor to the driving circuit. Because current is not needed to turn on the device, speed is increased by not having to wait for circuit current to discharge. Only voltage is used to control the gate structure in a power FET.

Disadvantages in a Transistor

Base current in a transistor is referred to as a minority current which causes a majority current flow between the collector and emitter. Restated, to turn on a transistor you forward bias the base and minority current flows, base to emitter, and cause the emitter collector current to flow (majority current).

This causes an offset voltage due to the diode junctions of the transistor. As current increases, the power/heat in the junction increases rapidly due to the voltage drop. The minority current severely limits the switching time in a transistor and gets worse as the current increases, heading for thermal runaway.

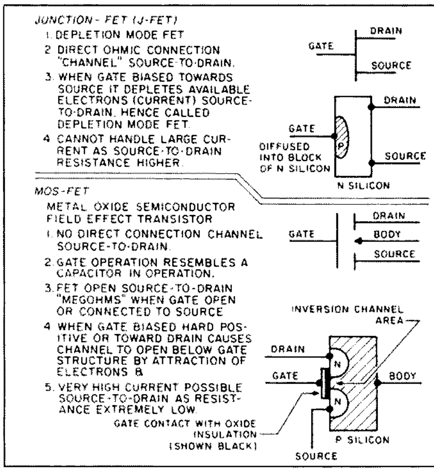


Figure 1. Comparison of low power JFET (junction field-effect transistor) and high power MOSFET (metal-oxide-semiconductor FET).

Why FETs and not Transistors

Because FETs do not require drive current, speed is greatly enhanced. Very high currents can be controlled from a simple drive source. TTL, transistor-transistor logic, is typically the method (with additional driver) used to drive a power FET or CMOS (complementary metal-oxide semiconductor) directly. The CMOS can drive power FETs because they operate at the required 10 volts, fully saturating the gate to deliver maximum switching speed. (Most CMOSs will operate to 20 volts maximum).

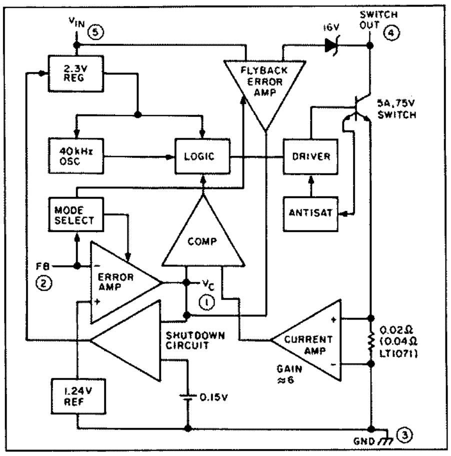


Figure 2. The LT-1070 switching regulator, current mode selector. Linear Technologies.

Operation of a Power FET

A power FET gate (enhancement mode) will turn on when the voltage is raised toward the drain and is above 2.5 volts, a valid TTL high (+2.5 to +5 volts). However, best switching times are made when the FET is saturated at the 10 volts drive level. Interestingly, unlike a power transistor which requires base current to turn on the emitter collector path, the HEXFET gate is controlled by a potential. The source to drain does not have a diode junction, and when turned on, it has a low resistance resulting in almost zero offset voltage.

The switching speed is greatly increased because of the near zero gate current (nanoamps) required to turn the FET on. The gate of these FETs looks like a very large capacitance to the driving circuit. To overcome this capacitive effect, you need two to three CMOS gates parallelled. The result is a good squared waveform on the FET's gate, allowing very fast switching. This extra circuitry is a small price to pay for high switching speeds.

As I said, the FET can switch impressive currents. The IRFP 140 is rated at 100 volts at a maximum of 31 amps, or 180 watts dissipation. The *on* resistance between source to drain of this FET is 0.077 ohms, when *off* is a few megohms. Compared to a transistor's time lag in turning off, the FET is so fast it's either on or off.

You might ask what this has to do with a microwave column. Most equipment for microwave use (solid state) does not operate from the standard negative ground 12 volt automobile power systems. Surplus microwave equipment usually operates from a positive ground, negative 24 volt power source. This is typical of the surplus "brick" type oscillators which make operation on stable SSB microwave so easy. Typical surplus microwave hardware was made for commercial telephone power, which is negative 24 volts.

In the ham shack this is not a problem. The problem arises when you try to obtain −24 volts in the field with +12 volt automobiles. Several operators overcome this difficulty by using batteries in series to obtain −24 volts. However, power supply systems can be made by running everything off of a standard positive automobile battery.

I was really excited when I located the surplus FETs. This gave me the opportunity to design a CMOS circuit for a driver as part of a power converter. The FETs can be switched with very high efficiency using a small toroid transformer at, say, 60 to 100 kHz. This would convert +12 volts input to an isolated 24 volts of whatever polarity you desire on the secondary at high current. Voltage ratios can be custom-wound to suit your requirements. Currently I am looking for a good core to wind my test transformer on, and I'll pass on the information as soon as I complete the project. I will try to wrap up the project and present the details next month. If all works out, I should have a kit with the board and key parts available.

Linear Technologies LT-1070

You can use other circuits for voltage multiplication and polarity reversal. The device that comes to mind

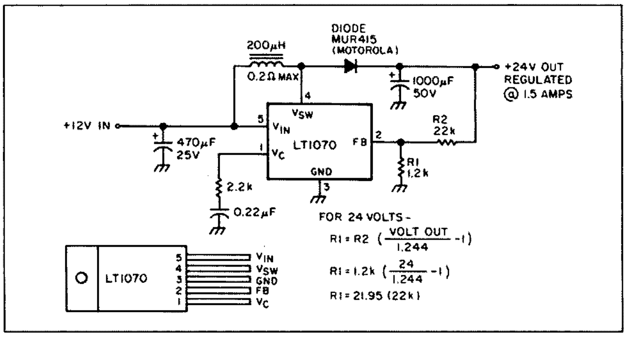


Figure 3. The LT-1070 positive boost switcher. +12V in and +24V out.

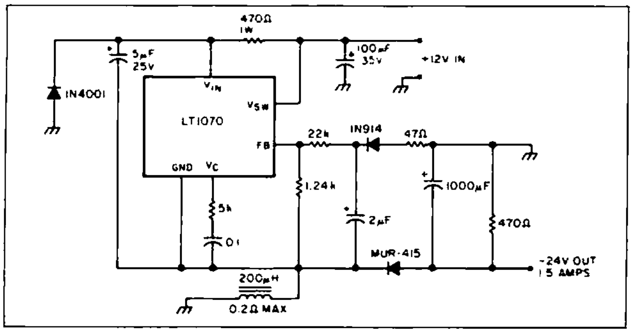


Figure 4. The positive to negative buck-boost converter of the LT-1070. +12V in and −24V out.

is the LT-1070 from Linear technologies. See Figure 2 for details. The normal circuitry for this switching mode power supply is not complicated, but it does use a few unusual components common to switch mode power supply designs. The inductor is a high current type, and as such needs to be wound with large diameter wire for low resistance. I made mine on a ferrite rod with #14 wire. Checking it out on an inductance meter, I adjusted the turns until I got 200 μH. (Note: 40 to 50 turns #14, three layers, on a 1-½" long, ⅜" diameter ferrite rod.)

The other unusual component is the rectifier. 1N4001s will just not work here! You need high speed switching rectifiers. You may be able to find a suitable source for these diodes in surplus switching power supplies and save a few dollars. Besides the LT-1070, the rest of the components are standard.

The heart of the switcher is the LT-1070, which has the oscillator, control, and protection circuitry all in a single chip package. Applications include a battery up-converter (200 watts), and power inverter with positive/negative or fully floating outputs. In our microwave application, we need negative 24 volts from a single 12 volt automobile battery system. I have shown both positive and negative applications. See Figure 3 for the positive voltage converter and Figure 4 for the negative converter. Depending on your power requirements you can have either polarity and the components remain about the same, just the circuit is rearranged somewhat to accommodate the conditions required.

Tone Warbler

Last month I ran out of space (got to watch my ramblings). See Figure 5 for the tone warbler I mentioned for use with the CW EPROM IDer. The tone source is tied into the power supply modulator (adjust the terminal of LM317) that powers the GUNN oscillator. This warbler tone is used on our wideband FM 10 GHz transceivers to assist in locating a signal in the noise. The warble sound is quite distinctive and recognizable in very low signal conditions. This simple circuit works well.

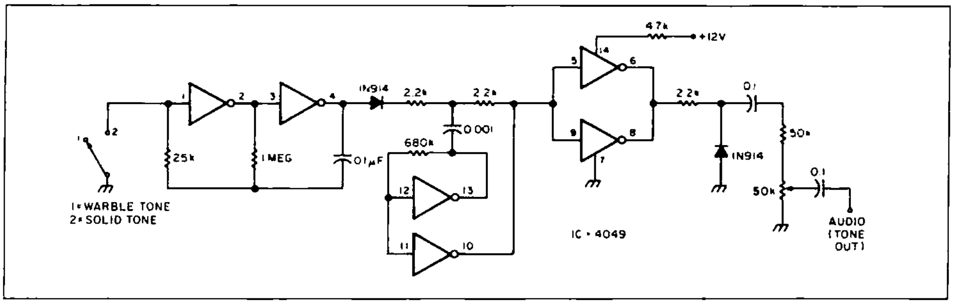


Figure 5. Warble tone oscillator. See the June 1990 column on the programmable CW IDer.

Comments from the Mailbag

Ed K3ZCY reports he is still in the process of converting his commercial 10 GHz transceiver to narrow-band operation. Ed is building an MMIC (microwave modular IC) 2.3 GHz transceiver, and a feed system for a dish he recently obtained. The feed is being built from plans found in *The RSGB VHF/UHF Handbook*.

Abdul Ghaffar Nagaria is trying to locate a source for dish antennas and LNA/LNC satellite receivers. I am sending some information, but due to postage constraints, I can't send him as much as I would like to. Is there anyone close to Abdul who can assist him? His address is Rm #7 2Nd Fl. Bhanji Jagomal Build, Jiven Street Ramsawami, Karachi 325, Pakistan.

Six meter news: Just received a report from Axel N8AXA/M/QRP, stating that he had just completed Mobile WAC on 6 meters QRP. That's 6 on 6 (6 continents on 6 meters). He sent a copy of the contacts, CT1DTO, DL3ZM/YV5, KL7NO, W6JKV/CT3, JA9IPF, KG6DX, CO2CB, HC1BI, and GM0EWX. Axel was very proud of these contacts and I'm sure that these took lots of planning and plain old good luck. Congratulations Axel N8AXA.

John K2SMZ reports he is building microwave equipment using several of the Solfan type transceivers that he picked up at a New Jersey hamfest. He had two units working on ATV at 50 feet. Currently he is building the 30 MHz IF systems for wide-band FM that appeared in the April issue of *73 Magazine*.

Richard W9RS wants to know if the San Diego Microwave Group publishes a newsletter. Well, Richard, so far we have not put out a newsletter, but if the interest is there we might take another look. Just writing this column takes quite a bit of time, and I am driven by my mail pertaining to microwave and related projects. There are lots of topics, such as the one this month. While not a microwave project in itself, you can apply it to portable microwave operation.

Jim WB0CHL is interested in passing color video on 10 GHz. He wants to know if anyone can provide him with information on expected signal quality. He is looking for firsthand information on systems using simple GUNN transceivers. Commercially, I have passed first rate video on portable microwave systems, but I haven't done this as an amateur. If you have information, contact Jim at 15265 Edenborough Ave, Prior Lake MN 55372.

As always, I will be glad to answer any questions pertaining to microwave or related topics. For a prompt reply please send an SASE. 73 Chuck WB6IGP

Number 28 on your Feedback card

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

Fourteen Years of "RTTY Loop"

If my calculations are correct, this should be the July issue of *73*. That being the case, this begins the fourteenth year of this column! Fourteen years... that's a long time to have been around. We have seen quite a few changes in that time, but don't worry, I don't plan to go into all of them today. What I do want to do is look at what you, the readers of this column, have to say, to ask, and to offer. Because it is what you all have offered in the way of support that has kept "RTTY Loop" looping these many years.

Speaking of looping, one of my, and Wayne's, concerns regards our youth. What they are doing, and how they are doing it, is a common focus of many interests and organizations. To this end, I received a note from John C. White WB6BLV from the Science Department of Lindsay High School, in Lindsay, California. John says his school's amateur radio club is growing in membership, with newcomers to the hobby attracted to the club station's equipment.

I replaced my old station here with a new, modern transceiver. The question of "what to do with the old gear" arose, and here is my answer. Sure, you could sell it, for pennies on the dollar. I guess if you really need the money now, OK. But why not donate it to a school or club near you? That old transmitter, receiver, or even a Model 15 will be received by a group of kids eager to get on the air. Besides the good vibes, there well may be something you can take off your taxes; but be sure to ask a tax accountant or lawyer for advice about that!

Kenwood and ICOM Mods

Interfacing various transceivers to terminal units is always a topic of interest, and from CompuServe comes this tip for Kenwood users. To connect the AEA PK-232 to a Kenwood TS-940, TS-440, or TS-140, use the 13-pin ACC2 connector on the rear.

The hook-up between the Kenwood and PK-232 is diagrammed in Figure 1. The signal level for received data, available at pin 3, is not controlled by the front panel audio potentiometer, so you can feel free to turn that tweedledee down. (Makes the wife and kids happy!) Thanks to CompuServe 76702,1013—whatever your name is—for this information.

In a similar vein, Zack Schindler N8FNR in Ferndale, Michigan, passes along this information for modifying an ICOM IC-740 to run AMTOR. According to David Wiegele, a customer service representative at ICOM America, Inc., the IC-740 can work on both HF packet and AMTOR. For HF packet, all that is necessary is to run it through a TNC controller. For AMTOR, you have to make a modification to the unit for the increased (faster) switching time needed for the mode. This modification is shown in Figure 2.

Also, it is desirable to:
•Keep the RF preamp switched off.
•Switch the AVC to "Fast."
•Turn down the RF gain as far as the signal permits.
•Take the AF output from the accessory socket, not from the external speaker socket or headphone jack. This cuts out the internal AF amplifier—these are usually designed to give a slow recovery to avoid thumps in the loudspeaker on change-over.
•In some cases, the antenna relay is slow to release. This is due to the protection diode continuing the current flow through the relay coil. You can cure this by installing a 22-volt zener diode in series with the protection diode (across the relay coil)—this is wired "back-to-back," i.e., cathode of the zener to cathode of the protection diode.

This information is provided as received from ICOM, and I have not personally tried any of it. You could drop them a note at 2380 116th Avenue NE, PO Box C-90029, Bellevue, Washington 98009-9029, if you have any questions.

Help! Help!

Here's a cry for help. Robert C. Dick K6YON has a ROBOT 800 terminal that he has been using for Baudot and ASCII since 1982. He relates that Robot Research seems to have been deleted from the face of the earth. Does anyone know if another firm has arisen to care for these aging beasties? Or will Bob be on his own when his ROBOT cops out? If you know, drop him a line at 1534 Sunset Hill Drive, West Covina, CA 91791. Be sure to "carbon" me, too, so that we can publish the information for others.

While we're asking for help, here is another plea. Buren Eagle W6VXI has a long history of RTTY interest, with all kinds of mechanical monsters. He is now trying to computerize, and he has a C-64 computer, Kantronic HamText program, and a Flesher TU-300 terminal unit. He has been unable to interface the C-64 with the Flesher and wonders if anyone can be of service. Anyone? With the popularity of these items in the RTTY community, I find it hard to believe that someone has not already invented this wheel. Why not roll Buren the information, at 309 Coronado Drive, Petaluma, CA 94954, and of course, send me a copy!

Mod and Demod

Last April, I realized that since I was first licensed in 1964, I had reached the twenty-five year mark, thus qualifying me for the Old Timer's Club! Imagine, me... an old-timer? This came to light with a letter received from Allen L. Barnett WB2QPM, who gives a little history of the word "modem" we so often throw around in this column.

Al tells us that this word originated with the carrier telephone equipment designed by Bell Labs and built by Western Electric many years before computers. As Al puts it: "In the late 1930s I was involved with the then new 'C-carrier' equipment being installed on the open wire lines that then crossed much of the country. We thought it a really great advance—state of the art! It added three carrier channels to the existing voice frequency channel, for a total of four channels per wire pair. The combined balanced modulator and demodulator panel in the terminal bay was known as the MODEM. Transmission was by SSB... [as well as by] the AT&T overseas radiotelephone circuits—including the impressive installation at Lawrenceville, New Jersey, where the acres and acres of rhombics would give any ham visions of what Heaven must be like!"

Well, all I can say is that the word "modem" is, of course, a contraction of MODulator and DEmodulator. Where it comes from, I leave open to the next entry!

RTTY.BAS Program

I've received a few questions lately about the (in)famous RTTY.BAS program published in the January 1988 column of "RTTY Loop." For those who missed the follow up, here goes. The program, as printed, is WRONG! The typesetting computer at *73* choked on the program listing as uploaded, and changed some operators to rather strange signs. *(Actually, it burped.—Eds.)* You can download the correct program from Delphi's CoCo Forum or CompuServe's HamNet. *(Also see the correction in the September 1988 issue of 73, page 57.)*

You can also ask a buddy who has a working copy of a disk or tape of the program to give you one. You can arrange for someone in your club or school to circulate copies. If all else fails, send me a disk or tape and two bucks, along with a self-addressed, stamped mailer for the return of same, and I will make you a copy. Be patient, though; I am a physician with a paucity of free time. I will try to get it back to you as soon as possible. As of this writing, by the way, I think I am caught up. If you are due a disk or tape back as of April 1990, and you haven't received it by the time this column is printed, please drop me a line. It is entirely possible that somewhere between my mailbox and your mailbox, something screwed up.

By the way, last month's column was on Prodigy, an on-line service. If you want more information about it, you can call (800) 822-6922. Ask for extension 556 for details on obtaining a Prodigy Service Start-up Kit. Packages re also available at most computer stores.

The response on the digitizer columns was quite gratifying, and I look forward to printing more, in future columns, of some of these more recent developments. Requests? Comments? Opinions? Send them along to me at the above address, or electronically on CompuServe (ppn 75036,2501) or Delphi (username MARCWA3AJR). 73

Table 1. Kenwood TNC hookup

PK-232	ACC2	
RED	Pin 13	Push-to-Talk line
SHIELD	Pin 12	Ground
WHITE	Pin 11	Transmit data in (PK-232 to Radio)
BROWN	Pin 8	Ground
GREEN	Pin 3	Receive data out (Radio to PK-232)

Table 2. IC-740 AMTOR Modification

Locate the following capacitors in the IC-740:

DC Block:	C17, C15
Reg Block:	C4, C5
Main Unit:	C16, C125, C84
RF Unit:	C133, C122

Decrease these capacitors to 1/5 of their original value.

Dx

Hams Around the World

Bob Winn W5KNE
c/o QRZ DX
P.O. Box 832205
Richardson TX 75083

Soviet Special Event and Contest Callsigns

In last month's column we discussed Soviet callsigns in some detail, including their structure and how to determine in which oblast the station is located. But, we left the subject before discussing special event and contest callsigns and one other class of callsign issued to old-timers.

During the past few years some old-time amateur radio operators have been given permission to abbreviate their prefix to a single letter, followed by the digit and regular suffix. U5FG, ex-UB5FG, is one of these. In the majority of cases these old-timers had callsigns that were issued many years ago when each republic was represented by a specific double letter and digit combination which identified the republic: UA1-6, UA9-0, UB5, UC2, UD6, UF6, UG6, UH8, UI8, UJ8, UL7, UM8, UO5, UP2, UQ2 and UR2. Most of these old-timers are listed in the Callbook under their old callsign. In most cases the location of these old-timers may be identified by using the digit and first letter of the suffix. As a general rule, a callsign with a single letter prefix may be deciphered as follows: R9AMO = RA9AMO, U6GA = UG6GA, U6FA = UF6FA, etc. Note that U6GA and U6FA were not previously UA6s, because according to the oblast list that you no doubt have purchased, there were no UA6F or UA6G callsigns listed.

Each year during May many Soviet amateur radio operators celebrate the anniversary of the victory of the U.S.S.R. in World War II by operating with special "E" prefix callsigns, which are not structured in the normal fashion. These special event stations, using the prefixes in the series EM, EO, ER, EU, EV and EW are in the following categories: EM—stations located in former capitals of guerrilla activity; EO—stations in cities that were awarded medals for their contribution toward victory; ER—ER3A located in Moscow; EU—stations in capitals of the 15 Soviet republics; EV—stations in capitals of Soviet autonomous republics (ASSR) and EW—stations located in "hero cities."

The prefix does not identify the DXCC country of these victory celebrants, but the QSL manager usually does. The QSL manager in 99% of the cases is the normal callsign of the station in question. Otherwise, a few simple rules will let you unravel the mystery of these callsigns. The first or only letter of the suffix identifies the second letter of a normal prefix: A = UA, C = UC, H = UH, I = UI, etc. For oblast collectors, in the callsigns with two or three letters in the suffix, the second letter of the suffix usually identifies the station's oblast. Example: EMØCOG was located in the Byelorussian Republic (UC), more specifically, in the oblast identified by UC#O. Other examples: EO4AHK (UA4H), EV4AY (UA4Y), EU4F (UF), EU7L (UL), EO8I (UI), EM8CCM (UC#C) and EU3A (UA3 Moscow).

There are other special event and contest callsigns that are fairly easy to understand, such as UØY, the abbreviated form of UAØY. In the case of RXØC the digit and first letter of the suffix identifies the location as Asiatic Russia and specifically as the Khabarovskij Oblast (operated from club station UZØCWA).

There are some special callsigns that are not easily deciphered, but you can make an educated guess or two. Several recent contest operations using prefixes in the "EX" series were probably located as indicated: EX9S (UA9S), EX1A (UA1) and EX8M (UM8). Getting the QSL manager of any one of these would provide the needed clue.

Callsigns in the 4K series are assigned to stations located outside of continental U.S.S.R.: 4KØ—stations located on floating ice islands (Arctic), 4K1—Antarctica, 4K2—Franz Josef Land, 4K3—European Arctic islands, except Franz Josef Land, and 4K4—Asian Arctic islands.

Quite often callsigns assigned to a special event will provide only general information about the location of the station. In the case of a recent dog sled race the callsigns 4KØAOC, 4K4DR, EKØAOC and EKØDR were assigned. 4KØAOC and 4K4DR operated from islands as indicated from their prefixes, but the exact operating locations of EKØAOC and EKØDR are not identified by the callsigns. However, they were both operating from locations in Asiatic Russia (UAØ) as indicated by the zero in the prefix.

Collecting oblasts, awards and understanding Soviet callsigns can be an interesting and challenging sideline for any DXer. The tips described should get you started.

Next month the discussion will continue with callsigns—callsigns galore! 73

Dealer Directory

73 INTERNATIONAL

edited by C.C.C.

Photo B. JAS-1b. second amateur satellite of Japan

Arnie Johnson N1BAC
103 Old Homestead Hwy
N. Swanzey NH 03431

Notes from FN42

It is now the middle of summer, for some of us at least. Dayton and Deerfield are past history. Field Day as well, many contests long gone and more to come, many more daylight hours to do outside ham things such as antennas, ground wires, and tower work.

Since I didn't make it to Ireland this summer, I guess I get to be part of those who will be doing some of that work myself, such as replacing the tripod holding my CL-33 tribander and 2 meter beam. It has lasted for about 15 years, which I now find very surprising. The tripod was never made for an antenna the size of the CL-33, and two of the three legs were broken from the twisting and the corrosion.

We should all probably check our outdoor equipment more often. If I had been inspecting my antennas and support system more regularly, I probably would have caught the impending problem last summer. I wouldn't have had to climb on the snowy roof in the middle of a New Hampshire winter to wire the thing together, hopefully to hold until spring.

I received a very nice letter from Enrique Leira EA1AZO who reported that we have been using the wrong emblem on the flag of Spain. Instead of an eagle, it should be an escutcheon, or shield of arms. The eagle has not been used for ten years! Though little detail will show, from now on we will have the correct emblem on the flag. We apologize for this error, and thank EA1AZO for pointing it out.

Hopefully you will all have an excellent summer. Enjoy!

—Arnie N1BAC

Roundup

Italy *From I0FHZ, President of the Orvieto Section of the Associazione Radioamatori Italiani.* Section ARI of Orvieto, in collaboration with the Touristic Office of the District of Orvieto, has established a Certificate for the 7th Centenary of Orvieto Cathedral. The period for this certificate is from May 1st to August 15th.

The presentation of the certificates will take place during the 5th "Symposium International Tecnichal Scientific of Experimentation" in Orvieto the 13th and 14th of October. Those unable to attend will receive their certificates by mail.

Contact the ARI for details of the contest at: ARI Sezione di Orvieto, Cas. Post. 3, 05018 ORVIETO (TR), Italy.

Japan *From the JARL News.* As most of us know, JAS-1b was launched February 7, 1990. Shown in this column is a picture of the amateur satellite.

Included in the JARL News was an introductory explanation of the mailbox. The information was too lengthy to be included in the column, but you can find it on the 73BBS in 73 Intl SIG titled JAS-1b.

Scotland *From John "Paddy" McGill GM3MTH, Coordinator of the Scottish Tourist Board (Radio Amateur) Expedition Group.* The Scottish Tourist Board (Radio Amateur) Expedition Group is at it again, operating throughout Scotland and Great Britain, from castles, distilleries, and other locations. *[Yes, I said distilleries!]* By the time you read this, several dates have already passed (April 14/16, May 12/13, June 9/10, and June 16), but others are still ahead: July 15/22 GB2NTS, August 18/19 GB2RB, and September 22/23 GB2NTS. For further information on the Thistle Awards and the Supreme Tartan Banner Award, contact: Paddy McGill GM3MTH, P.O. Box 59, Hamilton, Lanarkshire, Scotland ML3 6DB. *[Or check for STB(RA)EG Awards in 73 Intl SIG on the 73BBS.–Arnie]* Send log extracts to Robbie GM4UQG at the same address.

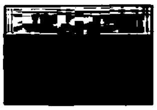
South Africa *From Gerald Klatzko ZS6BTD, Secretary of the SARL.* The South African Radio League Headquarters moved from Cape Town to Johannesburg in May 1989. For a while, a temporary postal address was used, but now they have a final and permanent postal address: S.A. Radio League, P.O. Box 807, HOUGHTON, 2041, Republic of South Africa.

Switzerland *From the International Telecommunication Union (ITU)* comes a Forum 91 Announcement and Call for Papers.

The World Telecommunication Forum has been held in Geneva, Switzerland, on a quadrennial basis since 1971. The ITU, together with many professional engineering societies from its 166 member countries, is now organizing the Technical Symposium, Part 2 of the 6th World Communication Forum. The Symposium will be held in Geneva from Thursday, October 10 to Tuesday, October 15, 1991, within the framework of TELECOM 91, the theme of which is "An interconnected world: improving the quality of life for all."

A limited number of papers will be accepted for presentation to the Technical Symposium. These papers must be unpublished and based on original research, developments and approaches carried out in the period between TELECOM 87 and 91. They should concern themselves with the technical aspects of telecommunications, technologies, networks and services, giving an overview of the present situation or the direction of research and development for the future. For more information, write Forum 91 Secretariat, International Telecommunication Union, Place des Nations, CH-1211 Geneva 20, Switzerland.

Photo A. Orvieto Cathedral



LITHUANIA

Jonas Paskauskas LY2ZZ
PO Box 71
Siauliai, 235400
Lithuania

The First Ham Convention which was scheduled to be held in Vilnius in early June *[as stated in the May 1990 "73 International"]* has been canceled or delayed until September, autumn, or maybe even next year. I am sorry that some of you who have already made plans and reservations will have to make changes.

Please bear with us as we attempt to pull our plans back together.

SPAIN

Woodson Gannaway N5KVB/EA
Apartado 11
35450 Santa Mario de Guia
(Las Palmas de G.C.)
Islas Canarias, Espana

Things have been very quiet in the Canary Islands. It has been very nice to meet some ham visitors from the United States.

I just received the information for the ARRL's International Travel Host Exchange program and I think we will register. My station is neither modern nor powerful, and my antennas are pretty limited, but it is my shack, in a small corner of a crowed room often in use for other work, but it is just fine for me. I get on when I feel like it and when I have time.

I don't operate during contests and won't tolerate a pileup. But I do enjoy courtesy and good wilt on the air. My wife and I both work a full schedule, so there is not too much time to get on the radio. With all this, why am I a ham at all? Well, it's that bit about international friendship that gets me, to meet and talk to interesting people of different backgrounds, and maybe develop a friendship or two along the way.

Well, that's all from here. For the hams on the mainland in Spain, please send me your happenings so that I can include them in my reports.

SWEDEN

Rune Wande SM0COP
Frejavagen 10
S-155 00 Nykvarn
Sweden

European Common License During the 1980s very successful efforts have been made within the CEPT organization in order to simplify the issuing of licenses to ham operators traveling in other European countries. CEPT, founded after World War II by the West-European telecommunication administrations, stands for Conference Europeenne des Administrations des Postes et des Telecommunications.

Now 26 countries in Europe have accepted the CEPT recommendation for visitors licensing, although only 15 countries have been able to implement it so far. This means that operating from another country within the CEPT concept does not require a separate application. This works the same as between the US and Canada.

We have two classes within CEPT rules, Class 1 for all modes and all frequencies and Class 2 for VHF/UHF. Of course, the national rules for the country we operate from must be followed.

Unfortunately, the Swedish Telecommunications Administration has not been able to implement the CEPT license fully. Only Class 2 is allowed here regardless of which license you hold in your home country. Swedish hams visiting other CEPT countries are not limited by this restriction. However, there is still the possibility of applying for a regular visitor's license. A fee is charged for that one, though.

Sweden does not require a reciprocal agreement for issuing a visitor's license. Work is in progress for implementing the CEPT Class 1 also in Sweden, and we hope for a good outcome.

HAREC Harmonized Amateur Radio Examinations Certificate (HAREC) is a new recommendation from CEPT which hopefully will be implemented later this year. The recommendation is that each CEPT country should have two classes of amateur radio license for which the requirements are similar. For example, Sweden has a Morse code requirement of 80 letters a minute (16 WPM) while most other countries have only 60 lor the same kind of license. Sweden will probably lower its requirement to 60 (12 WPM).

When HAREC is implemented, a person from a CEPT country who moves to another CEPT country does not go through a new amateur license examination. The harmonization means that CEPT countries will accept the other countries' license for the issuing of one in the new country. Many countries do already apply this in reality, but sometimes it's difficult to determine the comparative class of license. Regardless of HAREC, each country may have other classes of license in addition to these two harmonized ones, one for full privileges and one for VHF/UHF without Morse code requirement.

Top Band Widened in SM Swedish hams got more frequencies on the top band 1.8 MHz from February 1, 1990. The maximum power limit was also increased from 10 W input to 100 W PEP output. For the WARC bands the power limit was increased to 150 W PEP output. For other ham bands the maximum power limit is still 500 W input. A change will probably be made in the future and we do not know in which direction!

The frequency band on 1.8 MHz is now 1820 to 1850 kHz. SSB is now also allowed as well as participation in contests. This is also valid for the WARC bands, but on 10 MHz no contesting is allowed. 73

Number 41 on your Feedback card

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS. (2400 baud, 8 data bits, no parity, 1 stop bit. (603) 525-4438). Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters l or i, or even the number 7. Thank you for your cooperation.

I would like to receive information about satellite TV systems and design manuals, etc. *Arturo Marin, PO Box 948, Woodland CA 95695.*

I need any and all information on Dentron MLX-Mini 20 meter QRP, also EDGECOM System 3000 or FMS25. I will reimburse anyone for photocopies of manuals and schematics of these transceivers, service info, sales brochures and reference to anyone who might help repair these radios. *Mike Herman KC9NF, 1549 N. Cicero Ave., Chicago IL 60651.*

Needed: A diagram and manual for the Hammalund HQ 170 receiver. I will gladly pay for this info. Thanks. *R. Vic D'Agostino, 2113 Sunnythorn Rd., Middle River MD 21220.*

I am looking for info about the Allied Communications receiver, Model #A-2516. I would like a schematic, service info and info on how to use the VFO with a transmitter. *Jon Danford KACEM/0SOV, 2115 Joplin Ave., Joplin MO 64804. (417) 781-5243.*

I need a schematic and other associated documentation for an old Western Electric touch-tone pad, Model #1035C3A3. Thank you. *Joseph P. Jatis W9CYT, 1515 Somerset Lane, Schaumburg IL 60193.*

I need the following for my high school radio club: T-BUG monitor system for TRS-80 Model I assembly language, on tape or disk. Schematic diagram for R-19 military surplus receiver. Thanks. *John White, 560 N. Indiana St., Porterville CA 93257-2037.*

I would like to get in touch with hams operating 2 meter packet using a Texas Instrument TI/99-4A computer with a Kantronics TNC, Model KPC-2. *Bill Soble W3QXT, 9357 Hoff St., Philadelphia PA 19115.*

Blind, handicapped, house-bound ham with arthritis for 20 years wants to hear from people and seeks a portable shortwave receiver. If you have one you don't use, he would put it to good use with much appreciation. *Richard Lewis, 5909 W. 6th St., Los Angeles CA 90036. (213) 938-5347.*

Number 34 on your Feedback card

BARTER 'N' BUY

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73 Flea Market*, Barter 'n' Buy, costs you peanuts (almost)—comes to 35¢ a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to the *Barter 'n' Buy*, Donna DiRusso, Forest Road, Hancock NH 03449 ***and get set for the phone calls.***

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Number 35 on your Feedback card

QRP

Low Power Operation

Michael Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

Start with a Dead VCR

This month's project is a bit on the strange side. From the mail bag, I've received a lot of letters complaining about the lack of parts for building. Also, I've been asked for a small power supply for operating QRP equipment that's easy to build.

In the past, we've had several power supply projects which required some new parts. This month we'll build a one-amp regulated supply without spending any money.

Now how is this going to be possible, you ask? The supply shown in the photographs was constructed from the parts lying on the top of my workbench. Yes, I do have a large messy workbench, but with just a little bit of scrounging, you should be able to reproduce this project. Without spending your beer money.

The heart of this project is a VCR; a dead VCR. I picked up a used Sony Betamax at a hamfest. The owner said it only needed a fuse. Well, for ten bucks, what the heck. I took the bait and was the proud owner of a dead VCR.

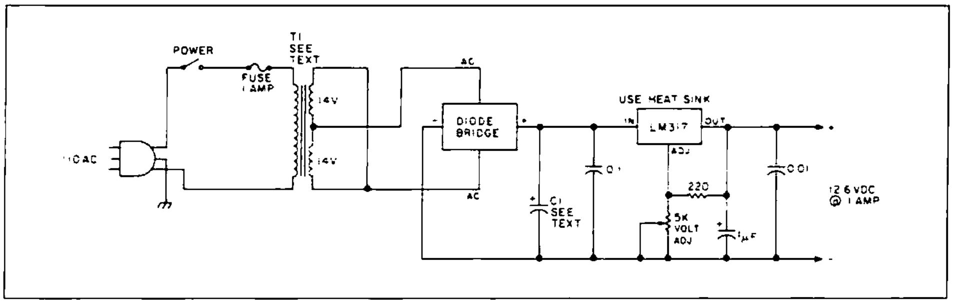

Figure 1. Schematic for the VCR junk box, one-amp regulated supply.

The previous owner was correct in one thing. The VCR did in fact need a fuse. What he forgot to tell me was that it also needed a capstan drive motor, head guide pins, and a few dozen small parts.

Playing with the thing, I learned quite a bit about the drive and tape transport system of a VCR. I got my ten bucks out of it and had a grand time, too. The VCR ended up in the junk box.

The Art of VCR Dissection

When I was looking around the shack for parts for this month's project, the dead VCR rang a bell. I have no idea how much power is need to operate all the drive motors, electronics, and whatnots inside one of those things, but the power transformer LOOKED right for my needs. So, armed with screw drivers and wire cutters, I gutted the thing. God! What great fun!

The most prized treasure was the power transformer. It was well shielded, and there were several secondary windings. Guessing from the size of the wires coming from the secondary, the transformer looked like it could produce at least one amp. Perhaps even more. One amp will supply us with quite a bit of power to operate QRP equipment.

In my zest with the wire cutters, I lost the pinouts for the transformer. Armed with a suicide cord and a VOM, I traced the wad of wires. As it turned out, the transformer had two windings at 14.8 volts each, one at 18 volts, and still one more at 40 volts. I cut the 40 volt wires short and taped them off. I didn't need those running loose inside my supply.

The 18 volt secondary was a bit of a problem. The wire size was too small to carry the required one amp. The short circuit current turned out to be only 250 mA.

The 14.8 volt secondary had heavy wires coming from the transformer, but the voltage is a bit low for a regulator. Most regulators require at least five volts ABOVE the regulated voltage, hence the usual 18 volt secondary.

Making New Connections

I connected both 14.8 volt secondaries in series. The result, as it should have been, was about 30 volts. This was way too high for my needs, aside from the fact that the capacitors I had planned to use only had a voltage rating of 35 VDC. The regulator would have to drop the surplus voltage in the form of heat, which was unacceptable.

What I did was wire both 14.8 volt secondaries in parallel. This increased the current to the bridge rectifier/filter capacitors, and the extra current helped keep the voltage stable under load.

The filter capacitors came from the VCR power supply; I un-soldered the caps from the power supply PC board. Using all the capacitors from the VCR, I came up with about 10,000 µF. I mounted the capacitors on a piece of perfboard, wiring them in parallel. The working voltage of the capacitors are all the same; 35 VDC. Some plastic standoffs support the filter board above the chassis.

The VCR used single diodes in a bridge configuration. I did not want to use the diodes from the VCR, so I chose a full-wave bridge rectifier, a small 6 amp job in a 1.5-inch square block, from the junk box. I could have used the diodes from the VCR, but I just didn't want to mess with them.

The diode bridge is mounted to the rear of the chassis. Use some heat-sink compound to aid in cooling the device. To keep an eye on what's going on with the supply, I used two lamps. I placed one across the filter capacitors and the other across the output of the regulator. This way, when the power supply is one, both lamps should be glowing. If you short the output of the supply, the lamp on the regulator will go out. This will let you know something is wrong with the supply or the connections to your project.

The VCR did not have the needed lamps, but the junk box yielded some nice ones. There was only one problem with them. The lamps were designed for 6 volts, not 12. Adding a current limiting resistor kept the lamps from burning out. If you have the proper lamps to begin with, you won't need to add the resistor.

On the AC line part of the supply, I added some bypassing. This helped keep RF out of the supply. The values came from the VCR. Nothing is critical, so use what you have, but watch the working voltage of the parts. Don't use anything less than 600 VDC for the capacitors. Also, don't forget the fuse and the three-wire power cord. Again, the VCR supplied the needed parts.

Stage by Stage

The heart of the supply, a simple three-wire LM317 regulator, sells for about $2 each at Radio Shack. In my supply, I use the 317, but in a TO-3 case. It's much easier to work with. The LM317 must be heat-sinked and insulated from the chassis.

Wire the supply up in stages. Do the AC line side first. Check for proper secondary AC voltage to the diode bridge. Check for output on the filter capacitors. This should be about 16 volts, depending on the secondary voltage of the transformer.

Wire up the regulator as per Figure 1. Adjust the trim pot for 12.6 volts output. That's all there is to it! The LM317 will supply one amp of current. That's about 12 watts of power. Five-way binding posts allow for easy hook-up. Not too bad considering what we have in the complete supply.

Button everything up and make sure you have taped off any unused secondary wires from the transformer.

Of course, you don't need a dead VCR to build this supply. I came across a dead computer monitor for the transformer. ■

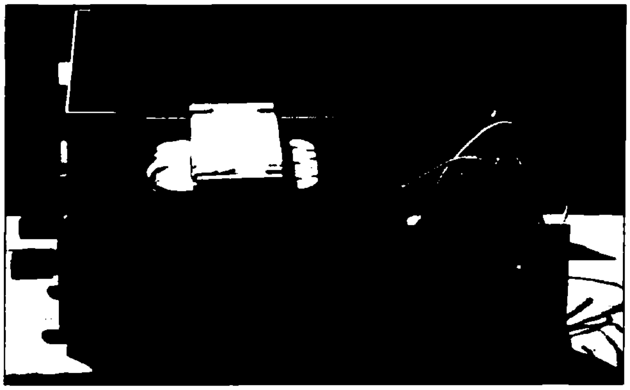

Photo A. The VCR power transformer, ready for wiring.

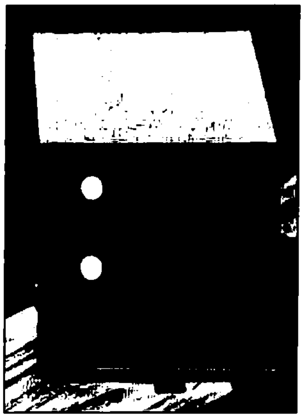

Photo B. The completed VCR supply project. Cost? Zip!

Number 36 on your Feedback card

Homing In

Radio Direction Finding

Joe Moell, P.E. KØOV
PO Box 2508
Fullerton CA 92633

Sniff with a Bug Buster

Some T-hunters are downright disappointed when they find the hidden transmitter sitting in someone's car out in plain sight at the end of a paved road. To them, a transmitter hunt is not complete without a chance to go "sniffing" on foot at the end. I must admit that I always welcome a challenging sniff, too. I certainly can use the exercise!

Still, there are many hunters who grumble when forced to walk to a concealed fox, because they don't have sniffing gear. "Body fades" with a handie-talkie are OK for beginners, but frequent hunters ought to carry a good field strength meter (FSM).

Traditional FSMs use a crystal diode detector (such as the 1N34A) and a high gain DC amplifier. Sensitivity down to 100 microvolts is possible with good diodes and FET input op amps. But the DC amplifier's offset drift means that a front panel zero control is required. Zeroing is tricky at high gain settings.

A Sniffer for the '90s

New RF technology is making the traditional detector/amplifier FSM obsolete. One-chip RF amplifiers that are nearly flat from HF to microwaves are now common and inexpensive. Putting the gain at RF instead of DC eliminates the zeroing problem.

Several companies make monolithic wideband RF amplifiers. You can experiment with the Avantek MSA0235-22, available from BCD Electro (PO Box 450207, Garland TX 75045-0207; 214-343-1770) or the NEC UPC1651G sold by All Electronics (PO Box 567, Van Nuys CA 91408; 818-904-0524).

For most simple projects, I prefer to dispense with an etched board and just wire the parts together on perf board. With RF circuits like this, however, a PC board and stripline techniques are musts for stability and wide bandwidth.

Optoelectronics Company (5821 NE 14th Avenue, Fort Lauderdale, FL 33334; 305-771-2050) has the answer. This company, well known for its handheld frequency counters, makes a sensitive FSM, model CCB. It features two Mini-Circuits MAR-6 wideband amplifiers and a logarithmic LED bar graph indicator.

The primary market for the CCB is people who think that there are tiny RF bugs all over their homes and offices, ready to pick up and transmit their most intimate conversations to earphone-wearing agents in trench coats sitting in dark vans. With the CCB and a whip antenna, these folks can while away the hours wandering around and checking their cupboards for the little critters.

I'm in no position to say how well the CCB works at detecting flea-power hidden mikes and wiretaps, but I found it to be great at T-hunt sniffing. At $99.95 wired and tested (add $3.50 to all prices for shipping), it's a bit pricey. Fortunately, there is a lower cost option. For $59.95, you can order the PC board and all parts, except cabinet, plus complete assembly instructions and a 7" x 9" blow-up photo of the completed board to guide you.

Make It Better

For another $20, you can get the company's nice cabinet for the CCB, but you can do better for less. I put the board on standoffs in a 4-½" x 3-½" x 1" aluminum chassis (about $7 locally). I made a front panel of surplus copper-clad PC board material (see Photo A).

A single 9 volt battery provides power, but my chassis has room for two batteries. After several bad experiences, I learned to have a spare battery available at the flick of a switch in every piece of RDF gear. I also added a test jack next to the dual battery power switch, so I can quickly check the condition of both batteries with the multimeter in my tool kit.

The monolithic amplifiers are tiny dots of plastic, about 1/16" in diameter, with four leads: input, output, and two grounds. Each of the two RF stages consists of just an amplifier, an RF choke to supply power, and coupling capacitors (see Figure 1).

The RF stages drive a Schottky detector diode, with DC bias for maximum sensitivity and good linearity. Detector output goes to a bar graph LED driver. A separate biased diode connects to the reference input of the driver IC. The two diodes track each other with temperature variations, so zeroing is a set-and-forget procedure.

With all LEDs lit, the sniffer draws 190 mA. That will drain the battery in a hurry. You will want to use the switch-selectable DOT mode instead of the BAR mode for most situations. Save the BAR mode for those pitch black no-moon night hunts when you can't see the position of the single dot. Current drain in the dot mode is 65 mA.

Experienced builders will have no serious problems building up the Optoelectronics CCB board. But you will need sharp eyes and steady hands. You'll also need a pencil iron with a tiny tip. A large illuminated magnifier would be a big help, particularly if you have "over-forty" eyes.

The etch and eyelets are tiny. Soldering on the three surface mount chip capacitors is tricky. You also have to carefully scrape away the green mask in many places to make room to solder down the RF components.

It Finds the Fox

I adjusted the internal zero control (R11) so that the leftmost LED is on with no signal input. Minimum RF sensitivity of the CCB sniffer is 600 to 800 microvolts, depending on the setting of R11. That's the level at which the second LED just comes on.

The CCB gives about the best sensitivity one can ask for in a wideband sniffer like this. Sure, you could add another RF stage or two, but it would do little good. Just about anywhere you go, there will be enough ambient RF in this wide spectrum to give you a few hundred microvolts from almost any antenna. This ambient RF masks weaker signals.

Although you could add internal tuned circuits and more gain, you won't need it for sniffing out most ham radio foxes. With a quarter-wave whip antenna, the CCB detects a 2 meter 1 watt handheld well beyond 500 feet away. Connected to a low-output military surplus loop, it got bearings on a 6 meter mobile station from 200 feet.

Your FSM may also come in handy while mobile, if the hider uses very high power and "swamps out" your receiver/attenuator combination. One night I used it with a full-size quad and attenuator to get bearings on a high power 2 meter fox from over a mile away in open country. The signal was so powerful that RF went around my attenuator and through the mobile transceiver's case. But the sniffer worked fine.

Advertised frequency range of the CCB is 10 to 2500 MHz. Response is fairly flat to 700 MHz, then it begins to fall off. Full sensitivity on 10 ham bands without tuning—that's pretty good!

Fixing the Glitches

There are a couple of minor design problems with the CCB circuit. Zero control R11 is a single-turn 5k pot. It's far too touchy and too high in value. The required resistance is about 250 ohms, so I removed the supplied part and substituted a 500 ohm multi-turn trimming pot. That made set-up much easier.

A 6.5 volt regulator supplies Vcc to the amplifier and display, intended to give constant sensitivity as the battery ages. But the regulator is an LM317, which has high offset voltage. It falls out of regulation when the battery drops below 7.9 volts. I want the unit to work with battery voltages down to 6.5 volts. There are low dropout regulators, such as the LM2941, that should allow it.

The bar graph readout is great at night, but it washes out in the bright sun. I added a hood to the front panel, made from ¾" wide strips of PC board material soldered together. With this shade, the LEDs are much easier to see in daylight.

How Close Am I?

Ordinary field strength meters give readings that are linear with input RF voltage. The LM3915 bar graph IC is different; it gives a logarithmic response. Each successive LED in the display represents 3 dB more signal than the one to its left. All other factors being equal, this means that as you walk toward the fox, the indication will increase two LEDs each time you halve the distance.

For example, let's say you get to the end of the road and the beam on the car indicates the fox is somewhere in the cactus patch ahead. You get out, pull up the whip, and the display shows LED #3. You count your steps as you gingerly walk in the direction that the beam points. When LED #5 comes on, you have gone 200 feet. That means the hidden T should be about another 200 feet away.

LED #7 should come on when you're 100 feet away, and LED #9 at about 50 feet. Of course, this method won't work if there are intervening obstructions or if the hider is varying the transmitter power. The distances given are relative, and applicable only to this example.

The logarithmic LED display eliminates the need for a sensitivity control, but occasionally you will encounter a very high power hidden T that "pins" the display before you find it. I added S3 and R12 for that condition (See Figure 1).

Closing slide switch S3 reduces the gain of the first RF stage by reducing its supply voltage. It changes the "pinning" sensitivity from 30 millivolts to 300 millivolts. Keep the R12 leads short.

OK, hunters, now you have no excuse when you are unable to walk up to the fox at the end of a hunt. See you at the hidden T!

Photo A. KØOV version of the Optoelectronics sniffer, with dual battery power switch and test point on top. The home-brew hood makes the LED display visible in sunlight.

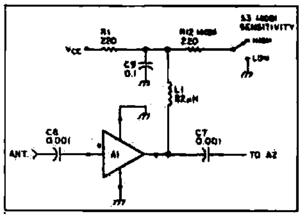

Figure 1. First stage of the FSM consists of the wideband amplifier and a few additional parts. R12 and S3 are added to provide switchable gain reduction.

Never Say Die

Continued from page 4

getting the League to provide the leadership amateur radio desperately needs right now. The cure is simple . . . elect new directors who can bring business expertise to running this $10 million business instead of trying to siphon off everything they can for themselves.

Hey, even if you are so brainwashed that you truly believe that I'm totally wrong. . . that I'm lying to "sell magazines" . . . what have you possibly got to lose in helping to elect some new directors? And why would you be against their being experienced businessmen instead of old ARRL organization hams who have gradually worked their way up the ladder to the most prestigious level of all?

No sharp businessman (entrepreneur) would waste his time with such a trivial pursuit of power and recognition as the League organization offers.

Do we need to throw all the rascals out? No, oddly enough there are a few intelligent directors who would like to help the League start providing leadership for our hobby. Unfortunately, they are greatly outnumbered.

Pressure Points

How can you, as one single amateur, make your opinion felt at HQ? You can do much more than you think. For instance, if you are a member you can make sure you vote in your next election. You can look at the business credentials of the office seekers and avoid anyone with a long list of League appointments.

You can make it your business to get to know the hams running for director and vice director and do what you can over the air and at local club meetings to bring about a change.

If you're not a member you have an even stronger say. The League lives or dies on your decision to join. If you pay your money, that's your vote for the status quo. Why should they change as long as you're sending them money every year anyway?

Your real power lies via the mail. In this you have an enormous lever to get the League directors to shape up. No, not in writing to them and complaining. Remember, most of 'em think you are an idiot. But you wouldn't believe what an effect you can have if you start writing to the *QST* advertisers and telling 'em that their supporting the League is going to affect your equipment buying decisions.

You see, power goes where the money goes. Money is power, right? That's not a new concept. Well, if you spend the dollar and look at the ARRL's financial statements, even as laundered as they are, you can see that a one-page advertiser in *QST* brings in far more money than a thousand members. So, while they can afford to ignore your individual complaints, you better believe they're not going to ignore any unhappiness coming from their horn of plenty.

You've got a powerful lever there, if you'll use it. Advertisers, who are not used to hearing this sort of thing, will start getting nervous when they get their first letter. By a half dozen they're going to be on the phone to Newington. If they get a thousand such letters, even the most dim-witted directors will be asking, "How far do you want me to jump?"

Yes, I know you're dreadfully busy. You certainly don't want to have to miss Twin Peaks or The Simpsons for something as trivial as this. And besides, your high school spiral notebook is almost out of pages by now, so you haven't any stationery. Further, suppose the advertiser lets the League know of your perfidy and they send their goon squad to break your legs? Maybe you'd better send your letter anonymously, just to be safe. Sure, that sounds silly, but I've met amateurs who really believe it.

The League sure has managed to instill fear in its members. I'll bet that 60% of the mail I get critical of the League asks please not to mention their name or call if I print the letter. I can't imagine what they think will happen to them. Has the ARRL got a KGB branch with enforcers who make people disappear? Have we got death squads in our hobby? You'd certainly think so to see the letters I get. . . and lots of 'em.

The Changes

I outlined the two basic changes the League needs to make to get our amateur radio hobby back into the black. We need to get our bands cleaned up. We need to put good strong peer pressure on the crazies and idiots who are using bad language, jamming, and otherwise making it less fun to be on the air for the rest of us.

Then we must organize a public relations campaign to acquaint the general public with our hobby. We must make sure that kids are aware of amateur radio and at least consider it as an alternative to all those heavily advertised computer games. We have lots to offer kids, if we can get the leadership we need to make it happen.

How much would it cost to set up and fund the two teams I suggested? For an organization the size of the League, with millions stashed away for a rainy day, any pleading that they don't have the money is absurd. It's already raining! Just take one look at their balance sheet that you got when you bought their annual report for a dollar and you'll see that this is a matter of management, not money.

I'm not talking about hiring a big bucks Madison Avenue advertising agency and budgeting a million dollars of ads. . . about what it takes for one minute of TV during the superbowl game. I'm talking PR, where the cost is miniscule and the results king-sized.

I'm not talking about $100,000 videos extolling amateur radio. . . extravaganzas which are mainly self-congratulatory and do virtually nothing to get across to the general public how much fun we're having and how little our hobby actually can cost.

If you want to sell a product you point out the benefits to the customer, not the technical specs. We should be showing kids having a ball hunting hidden transmitters on foot. We should show young hams swarming over hamfest flea markets, buying cheap used equipment. We should show 10m Novice DX QSL collections.

With a little editing the League could put together one whale of a Field Day video, made up from home videos sent in by a couple hundred affiliated clubs.

The money is there. The resources are there to do what needs to be done. The only thing lacking is for the leadership to make it happen.

You have the choice. You can, with a couple dozen letters, change the history of amateur radio. Or you can let it continue to gradually slide into oblivion. And there's just a chance that if you do write and the League is pushed into getting our hobby growing again, that the kids we bring in will be the American engineers, technicians and scientists our country so desperately is going to need in the future.

Making Some Money

Letters are still coming in from readers complaining about being short of money. When one considers how much of it is out there and how easy it is to get, I wonder why there isn't more interest in improving the odds.

The Financial News Network (FNN) Entrepreneurial Van stopped by to interview me a few days ago. One of the questions they asked, naturally, was how I'm able to spot so many potential businesses. How was I able to figure out ahead of time that cellular radio would be big? That microcomputers would be enormous? That compact discs would grow as they have?

I'm giving a talk in a few days to a Mensa (high IQ) group on the subject of being successful. In case you are laboring under the mistaken idea that it takes brains to be a success, I might point out that there seems to be little relationship between brains and success. Ray Croc, the McDonald's chap, wrote that in his book on how to be successful. Even after meeting and talking with several thousand Mensans I have no reason to challenge the concept. They're a great bunch of underachievers.

As a ham, unless you cheated to get your ticket, presumably you have both a knowledge of electronic fundamentals and an interest in learning more. This gives you an edge. And that's what you need to get more than your share. Gelt without guilt, right?

If you think we're living in a technological age now, wait'll you see what's coming. Technology is going to keep right on growing, whether you are able to cope with it or not. And the better you're able to cope, the more potential you have to make money.

Technology tends to bewilder older people. Kids, who have no fear of computers, jump right in. Of course they make up for their ability to use computers by a growing inability to understand them. Kids, abetted by their parents, who are busy watching ballgames on TV, opt for the easy. They are avoiding math and science courses. Too much trouble.

There I go grumbling about how parents are allowing their children to be dummies. Encouraging them, really. That isn't going to help you make money, is it? Well, not unless you take note of the problem and keep it in mind so that when something turns up which might help solve the problem, you'll look into it.

The easiest way to make money is to find a product or service that is needed and supply it. Find a niche and fill it. There's nothing new about that advice, but how seriously have you integrated that concept into your own thinking? Once you start applying the idea to real life, you'll start seeing all sorts of wide open niches.

Okay, presuming that you have some electronics skills, they will open more and more opportunities to you as the whole world goes high tech. Right now there's a tremendous need for people to fix electronic equipment. If you start specializing in computer repair in your spare time, you'll quickly find your time filled up. One thing we know for sure about electronics, everything breaks. If you can fix 'em, you're in business.

VCRs, which are in almost every home, break. They break a lot. Has it ever crossed your mind to find someone who fixes VCRs and see if he needs some help? That comes down to the most basic of common sense . . . why spend your own money to learn when there are people who will be delighted to pay you? Learn on other people's money. Once you're good at VCR repairs you can open your own shop.

When you have more business than you can handle, hire on someone and train them. If they're entrepreneurially inclined you'll be training a competitor. If not, maybe you can open a second shop a few miles away.

Audio equipment breaks. Radios break. Ham gear breaks. Getting things fixed today is a major hassle, as you well know. Heck, many families throw out old VCRs instead of getting 'em fixed. Cheaper. Maybe you can get 'em to throw their broken VCRs your way. . . then you can fix 'em and sell secondhand VCRs with your guarantee.

Years ago I editorialized about getting into the home security business. I keep hearing from readers who took me up on it and have done well. Some have built multimillion dollar businesses. There was a ham here in New Hampshire who said my editorial got him going, but alas he didn't pay attention to my advice on smoking, so he dropped dead in his 40s.

The latest Heathkit catalog got me all excited. Their big new push is in gadgets to remotely control your house lights and appliances. What a fantastic opportunity, since you presumably understand how these things work, to sell, install and service them.

I'd sit down at a Macintosh desktop publishing system and put together a

catalog to spread around the neighborhood, looking for potential customers for these systems.

Heath also sells some nice home security products . . . plus there are several mail order security product firms.

People love gadgets, but their ignorance of electronics makes them afraid to even try to use them. I'll bet you can find an endless supply of people who would love to have remote home control units, if only someone else would install a system and teach them how to use it.

While you're there you might also show them how to program their VCR. I forget the percentage of homes where no one knows how to do it, but it's depressing. They just use it to watch rented movies or to make instant recordings. When they get a new VCR you can come in and show 'em how to use it. They're all different.

The opportunities to make money are everywhere you turn, once you tune your mind to that wavelength. The primary obstacle to having all the money you want is your own inertia. You have, somehow, to develop your own drive, to be different. Inertia . . . habit patterns we're too lazy to try and break. It's the same inertia you face in making other life changes, such as investing in travel, getting your weight down to where you know it should be, kicking various drug habits such as beer and cigarettes . . . things which will help you live longer and enjoy your later years more.

There are two hard parts. First is making the decision to change. Second is to stick to it when temptation comes . . . which it will. That's when you face your most difficult test of character. Keep your goal in mind, whether it be to make money, lose weight, or kick a drug habit.

Yes, I know all about your not having time. Sure. Tell me about time. I'm writing this on my laptop computer on a flight from New Orleans to Atlanta. Sherry and I popped down to Mobile and New Orleans for the weekend. I got together with my old WWII submarine shipmates for a reunion aboard our old boat, the *Drum SS-228*, which is on display in Battleship Park in Mobile. Murray Flanders K4RQO has a ham rig set up on board . . . look for him Saturdays at 1600Z on 14,243.XXX.

While there I gave a talk to the Mobile ham club about the no-code rulemaking proposal. They fielded over 80 members for the meeting!

I also had an opportunity to meet the new skipper of the battleship *Alabama*, Fred Lovewood WA4JVA. I immediately came up with an idea for making the *Drum* a lot more fun for visitors. How about setting up speakers in each compartment which explain what went on there during a war patrol? Then, maybe every 20 minutes, break in on the explanations with the battle alarm, dim the lights and announce that the boat is being attacked and is going to submerge. The diving alarm would sound, then the sound of air whooshing out of the tanks, "rig all compartments for depth charge and run silent," then there would be the sound of screws passing overhead, a series of realistic depth charge explosions and more lights flickering. Finally, a voice says, "We've managed to evade them, Captain." "Secure from depth charge, secure from battle stations, surface." The surface alarm sounds and the lights go back to normal. The idea is to put some excitement into the visit to the *Drum* and make it more than a look at a bunch of gauges and valves. Take a cue from Disneyland and make it an exciting visit. The whole thing shouldn't cost much to set up.

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock, NH 03449. Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

After the memorial services aboard the *Drum* we drove to New Orleans to arrange for pictures to be taken for the second Scott Kirby album of Scott Joplin music. Scott recorded it in our Hancock studio, but we needed a picture showing him at his street piano with a Mississippi river boat in the background.

". . . there are a few intelligent directors who would like to help the League start providing leadership for our hobby. Unfortunately, they are greatly outnumbered."

Scott took a day off from playing Joplin on Royale Street in the French Quarter. We found just the right spot for a photo for his new album . . . a place where he would be able to roll his piano.

When you get to be my age (68), are you going to be making money hand over fist and having the time of your life, or are you going to turn into a veggie and stop all further contributions to the world . . . other than helping maintain a QRM layer on the air?

In addition to getting your own business going and making money . . . lots of money . . . you're needed to help get PR for amateur radio, to help get radio clubs started in local schools, to teach ham classes and so on. There's more than enough for you to do, no matter how old or young you are.

Good-Bye *Ham Radio* Magazine

It did not come as any big surprise when *HR* announced its demise. They'd been up for grabs for several years and we'd been dickering with them recently to fulfill their subscription obligations. Apparently *CQ* was in more desperate need of a circulation boost than *73* and outbid us.

With amateur radio winding down, the ham industry has less and less money for advertising, so there just wasn't enough to support four magazines. I doubt there's enough to keep three going, but we'll see, won't we?

HR blew away mainly because the publisher didn't have anything else to tide him over the tough times. My *CD Review* is doing fine thank you, and is quite capable of keeping us growing no matter what happens to the ham industry. *CDR* was one of the fastest growing magazines in the country last year and will be again this year. It's growing right along with the music industry, buoyed up by the exploding CD market.

I'm starting several new industry trade publications to help the music industry grow even faster. If you're looking for a fun industry to get into, you might consider the record business. It's really just started in its growth. For instance, Europe is way ahead of us already. 40% of the Europeans have CD players now vs. 20% in the U.S. You only have to look at the European record stores to see where things are headed here.

Getting back to the *HR* debacle. Publishers who don't diversify can get in trouble when their industry is depressed. *CQ* is facing the same desperate dilemma. They've got a couple of other small new publications, but they're not in growing industries either. And their ham niche is awfully narrow: contesting.

Contesting pretty much rules out any great enthusiasm from Novice, Tech or General Class licensees. This is why I suspect they're going to be very disappointed in the reaction of the *HR* subscribers to the change. If the sentiment expressed at the *73* booth at Dayton is at all indicative, they'll get very few renewals. We had the biggest year ever for subscribers at our booth, with a high percentage of them very vocal about the *HR* disaster.

I've seen this happen before. A good friend of mine, David Ahl, published *Creative Computing*. He got sucked into buying a subscription list from a dying computer publication and the added costs put him out of business. He had to sell for peanuts to Ziff-Davis, where his magazine was eventually folded.

Buying the subscription list of a failed magazine is a serious gamble. The publisher is betting that the readers will renew their subscriptions for several years, thus eventually recouping his investment. Even if he only pays a dollar for the list, which is the usual price, he's still got the enormous expense of sending his magazine every month.

Of course, if he increases his advertising rates to reflect the larger circulation, he can benefit. Unfortunately, it takes months before the new ad rates take effect, so that's a long term benefit . . . and only if the readers do actually renew. I haven't seen any increased *CQ* ad rates in effect yet.

What about all those nice construction articles which made *HR* so popular with the more technically inclined hams? We had a parade of *HR* authors coming by the *73* booth at Dayton to discuss writing for us. Where else could they go? We've gotten promises of great material, so I think we'll be holding up that end of things just fine.

Hedy Lamarr—Inventor

Bet you didn't know that Hedy Lamarr, together with composer George Antheil (Warsaw Concerto), got a patent on frequency hopping in 1942. Her system used piano rolls to change the frequencies, with the original intent being to provide an unjammable signal to control torpedoes. The system proposed 88 frequencies . . . the number of keys on a piano.

It took the military twenty years before they started using her technology. Today it's a staple of military communications.

How much did Hedy and George get for their idea? Zilch.

If you'd read *Forbes*, like you should, you'd know about all this. ■

Number 37 on your Feedback card

LOOKING WEST

Bill Pasternak WA6ITF
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No-Code or a Contest of Will

No-code will either be the FCC's way or it will be the FCC's way. That's the feeling I got as I sat in on a presentation by commission representatives to the Amateur Radio Industry Association's April 27th meeting in Dayton, and also at the review of an audiocassette of the FCC's forum at the Hamvention. The presentation was a sobering experience, one I want to share with you.

The facts of life appear to be these. The FCC has opened the no-code Pandora's Box only because the ARRL was willing to let it be opened. But this time that box will not be shut if the ARRL changes its mind. In other words, some form of no-code license will probably be a reality within a year or so, with its privileges to be determined from comments. What appears to have been determined already is that this new code-free Communicator ticket will be created, and it will replace the current Novice and Technician Class licenses as the singular entry level to the United States Amateur Radio Service.

For what they claim to be budgetary reasons, this is not a negotiable point with the commission. The only parameter we as hams can help set—with emphasis on the "help"—is the difficulty of entry. If my assumptions from all the foregoing are correct, then it stinks!

Hidden Motives?

A number of years ago, an FCC official who will remain nameless told me that "... the ARRL is under the mistaken belief that it is at war with the FCC, only we at the commission have not noticed the shells yet." Could it be that this is the government's way of finally saying that they have taken note of the artillery from Newington and that this is their return volley? I say this because the proposal as outlined in Docket 90-55 is so absurd as to make me wonder if there is a more sinister reason behind the latest no-code move.

There can be one, and only one, reason to abolish the code requirement for entry into amateur radio—growth. Massive growth at levels unprecedented in the history of the service. Clearly, then, the way to such expansion is through simplification of the examination and a lowering of the entry level standards. Is creating an examination with more than twice the technical difficulty level of the current license going to achieve this goal? Only a blathering imbecile would believe that it would! I sincerely hope that you are not the latter.

To grow, amateur radio does need code-free entry. It needs what amounts to a simple-to-attain license with mainstream operating privileges. By dropping the code requirement from the current Novice, and deleting the 10 meter privileges for anyone entering the service after implementation, this is easily accomplished. Cost is minimal and nothing much changes. This is the obvious solution to a tough problem, and one that most hams would be willing to live with.

But there is one fly in the ointment. The FCC is living under a yet-to-be-proven belief that rampant cheating is taking place in Novice licensing, and that they must do something about it. I was amazed to learn that they are convinced, or at least they say they are convinced, that the level of those getting Novice tickets in ways that violate federal law is so high that they must look for a way to violate federal law to abolish the license! That's right, I say openly that the FCC is looking to circumvent Public Law 259!

A Bit of History

When US Senator Barry M. Goldwater K7UGA sponsored the legislation that led to the creation of laws permitting the FCC to use volunteers for both amateur testing and regulatory enforcement, he threw in a kicker. Senator Goldwater clearly understood that the survival of our nation into the next century would depend on our being able to have a top-notch base of scientists and engineers. He also realized that amateur radio has always been a major route by which youngsters reached for those careers. So, the legislation contained wording to the effect that the Novice license would always be given free of charge.

This means that it cannot easily be brought in under the VEC testing system unless VECs are willing to administer the test free of charge—something very unlikely, given the costs of operating a testing organization. So, the boys on "M Street" have come up with what they think is a way to solve their perceived problem of Novice cheating and at the same time save a few dollars for the government.

Since the Novice ticket really can't be brought under the VEC testing system, they propose to abolish and create a new license that *can* be tested by the VEC system. In the process, they figure that they will be giving much tougher technical examinations for entry than ever before, so why not kill off the next step on the ladder as well?

This writer might be able to buy the approach if not for a few small items. First, let's have proof that this massive Novice cheating is taking place! So far, I know of only two cases that the FCC has publicized—one on Long Island, New York, and the other near San Juan, Puerto Rico. Both of these occurred more than two years ago, and nothing has been publicized since. Probably there is some cheating, but I'm willing to bet that it's no worse than before PL-259. And I don't think you can blame it on that farce called "Novice Enhancement," because the latter was of little benefit to Novices. It brought in Technician Class operators by the hordes, but Novices? Who is kidding who? It should have been called "Technician Enhancement." The commission is going to have to show me—and I hope, show you—a lot of documented cases of cheating and abuse to where the viability of the Novice license class is at stake before I'll buy that poppycock!

Second, there is the complexity of the proposed written test element. It would amount to a combination of the current Novice Class element, Technician Class element, and an additional five questions that the ARRL is demanding so as to appease its doddering masses. I don't know about you, but to my way of thinking, forcing someone to memorize—and I say memorize because that's the way it's done—that much knowledge just to talk across town on 220 MHz is not going to seem very enticing to very many. In fact, it will probably have the opposite effect. I seriously doubt if the almost minuscule growth of today's Novice can be attained with tomorrow's Communicator. Those of you who feel that "no growth is good growth" or that "our bands are too crowded" should be happy. At least until 20 and 40 meters disappear from use.

If I had my choice of staying with the current entry structure or going to the Communicator in the way it has been presented in Docket 90-55, I would opt for the Novice—and I am very much pro no-code! I feel that a properly written set of regulations creating a no-code license would go a long way toward revitalizing amateur radio. But what Docket 90-55 offers is not the needed "No-Code for Growth" that a good recruitment campaign can be built on. It's nothing but a trade-off between artificial barriers for very obvious political reasons.

Even with the 5 wpm CW test, the current Novice ticket is a lot easier to get—and that's apparently what the FCC does not like to see. The Novice also offers far more in the way of privileges than this "fallacy" called the Communicator. And maybe, generating feelings like these is the real aim of Docket 90-55. That of creating an air of discontent in the amateur community, and throwing a barb at the American Radio Relay League—the government's long awaited (and expected) return volley north toward Newington, Connecticut.

In my view, the FCC has put the ARRL, and the rest of us, into a no-win situation. If my assumptions are correct, we are seeing the result of several decades of the adversarial and sometimes confrontational relationship between our national society and the government body that regulates us. It's a mini-war that neither side will admit, but it started some 20 years ago at a hearing before the commission on a then-proposed ban on CB linear amplifiers.

Reportedly, the FCC commissioners were very much disenchanted with the way in which the ARRL presented its opposition to the ban, and the relationship has been downhill ever since. So is the amplifier ban that keeps you from buying an all-band linear that you don't have to modify yourself for 10 meters. (Yet the illegal CB amps are still available at truck-stops nationwide. Some ban!)

Who Is the Communicator For?

And now we have the Communicator. A putrid excuse for a code-free entry level amateur license. A proposal with so many new artificial barriers to getting new people interested in amateur radio that I cannot believe it to be anything other than the aforementioned retaliation from the FCC to the ARRL. The Communicator will not entice youngsters to amateur radio because it offers them nothing they cannot get for $49 at K-Mart in the form of a CB set. It will make it more difficult for the elderly to study the material, retain it and join in, with the number of questions more than doubled.

As for the young adult busy starting a family, just forget it. The Communicator offers little. And for those just passing into middle age and with the greatest level of disposable income? People who have traditionally been the backbone of amateur radio? He and she are already hard targets to recruit. In this area, the Communicator, as proposed, will be a "death knell." How many of these people have left of their own accord after getting in the so-called "hard" Novice way?

So, what really scares me is the fear that many of the "doom and gloom" predictions of the publisher of this magazine will come to pass well before we depart this mortal world. More important, what makes me angry is that you and I really are a part of a "contest of will" between the FCC and the ARRL. Pawns in a chess game. I, for one, don't like being used! de WA6ITF

Notes from the ELK

Bill Brown WB8ELK

Foxhunting!...

In this issue we highlight a really exciting part of amateur radio. This is one area where home-brew equipment is still king. Not only will you have a great time putting together your direction finding system, you'll also be able to join in the adventure of tracking down hidden transmitters. Even if you don't join in the hunt, it's fun just to gawk at the incredible variety of mobile and portable antenna arrays that show up at these events. Many countries consider foxhunting a true sporting event, complete with international competition. These foxhunts sometimes have hundreds of competitors starting out with a footrace while homing in with DF gear. You can bet the youth of these countries know that a radio can be used for something other than listening to the latest hit sounds!

One thing for sure, foxhunting is never boring. Each hunt is usually good for a few adventure stories that you're liable to hear on the local repeater for some time afterwards. Places to hide the hidden transmitter are endless and can be incredibly creative. During their last hamfest, the Indianapolis Foxhunt Club decided to hide the hidden transmitter on a mystery person who roamed the flea market. In order to find the quarry you had to wander up to perfect strangers and say, "Are you the fox?" This led to a nasty stare in most instances and came close to placing some participants in danger of a punch in the nose! Some groups go to incredible lengths to disguise the fox. During a recent Florida hunt the fox dressed up like a bag lady, complete with a shopping cart filled with old clothes and trash. The hidden transmitter was placed in the shopping cart. The bag lady fox sat on a park bench for hours having a great laugh as the hunters wandered past never once daring to ask to look in the cart! The Indianapolis group has started a new twist with an Easter Egg style hunt. They hide several low power two meter transmitters scattered around a small area, hidden in bushes and trees. Future hunts will actually use plastic eggs to house the transmitters. Wish I'd had a way to find Easter Eggs like this when I was a kid!

Our cover photo shows Eb WD9I bagging a five-point ELK (WB8ELK balloon transmitter with whip antenna). Eb showed us that you don't need a lot of fancy equipment to track down a hidden transmitter. This balloon transmitter (10 milliwatts on 2 meters) traveled 85 miles to land in a field 20 miles west of Eb's house. Beam headings from tracking stations across the Midwest narrowed the search area down to a 10-mile-square area. Using nothing more than an HT on the windshield of his car and a scanner on the front seat, Eb headed out to join in the search. After scanning the area for an hour, he heard the squelch break and the signal quickly become full-quieting. After he drove 100 yards further down the road, his scanner came to life. Jumping out of his car, he saw a small white dot in the middle of a plowed field and ran out after it. He'd found the package! Eb's now hooked on foxhunting and plans to join in the many Indianapolis hunts.

Hopefully this issue will help stir up some more foxhunting activity and show our young people that amateur radio can be really FUN!

Things to Come

Future issues of *73* will feature other exciting areas of amateur radio such as ATV, packet, high altitude balloons, OSCAR & weather satellites, QRP, HF operations, DXing, emergency communications, SWLing, scanning, antennas and lots and lots of construction articles. Since the demise of *Ham Radio* we intend to fill the gap with as many technical and construction articles as we can place between the covers. When possible, we'll include Radio Shack part numbers for the components in our articles. If the parts aren't available at the Shack there are several excellent mail order parts houses (Jamesco, Digi-key, Mouser and Circuit Specialists, to name a few) which should net you just about any component needed for the contruction articles published in *73*. Also, when possible, we'll let you know the source of any specialized part in the article. To save you the trouble of searching for parts we'll also be working with some of the kit manufacturers such as Ramsey and A & A Engineering to provide a complete kit for selected articles.

If you have a neat circuit or project you'd like to share with *73* readers please send it in! Please include a concise description of the circuit and its operation, a schematic diagram (can be hand-drawn as long as it's readable), parts list with manufacturer sources if possible, p.c. board layout (if used), parts placement and some photographs. If you or your club has been involved in an event that may prove interesting to *73* readers (DXpeditions, emergency communication, parades, walk-a-thons, severe weather watching, etc.), write it up, take some photos and send it in! Not only will you gain recognition and fame as a nationally published author, you'll get paid for it! If you're interested send for our "Writer's Guide."

We'll be featuring photos of radio clubs and groups across the nation in our future issues. Take a group photo and do a short write-up describing your club and when it meets. Also, if you know a ham whose efforts should gain recognition, send us a photo and some biographical info for possible use in the "Ham Profiles" section.

The *73* BBS

We've added several new special interest groups (SIGS) to the *73* phone-line BBS. Look for the ATV, Packet, Foxhunting, QRP and School SIGS. This is a *73* service available to help you keep in touch and exchange information with others of similar interests. Drop us a line if you'd like us to add any additional SIGs. You can reach the BBS via (603) 525-4438, 300 or 1200 Baud, 8 data bits, no parity, 1 stop bit.

Till next month, 73s... the ELK

Propagation

Jim Gray W1XU

Jim Gray W1XU
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Payson AZ 85541

Has Cycle 22 Peaked?

At the time this forecast is being prepared, at the end of March, it appears that the sunspot maximum for Cycle 22 is either imminent or just passed. It also appears that Cycle 22 has peaked higher than any previously recorded cycle except Cycle 19, which set a record. Because of the manner in which "smoothed sunspot number" is calculated, it will be another six months or so before we can be sure that Cycle 22 has really peaked.

July will be a generally poor month for DX on weekends, sorry to say, and the generally higher atmospheric noise levels, solar absorption, and possible magnetic field disturbances on many days probably will combine to make the DX bag a poor one for the month.

However, you ought to never be discouraged by forecasts, but instead, follow the WWV broadcasts at 18 minutes after each hour to keep you up-to-date on the trends of solar flux (the higher the better) and the earth's magnetic field index (the lower the better).

On good days (second and fourth weeks of July), the HF bands will be open until after dark in the Northern Hemisphere, and very good VHF openings may present themselves on many days.

There will be a solar eclipse on July 22; it will be total for N.E. Europe, N. of Greenland, N. Asia, arctic regions, N.W. of N. America and the Hawaiian Islands. Elsewhere it will be partial.

For those who are interested, the full moon occurs on July 18, and the sun will be farthest from the Earth on July 4. The worst propagation days will probably be centered around July 2 and again around July 16.

Keep smiling—things can only improve!

EASTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	—	20	20	—	—	20	20	—	—	—	—	20
ARGENTINA	15	20	20	—	—	—	—	—	—	10	10	15
AUSTRALIA	15	20	20	20	—	40	20	—	—	—	—	10
CANAL ZONE	15	20/40	20/40	20/40	—	20	10	10	10	10	10	15
ENGLAND	40	40	40	—	—	—	15	[illegible]	10	[illegible]	[illegible]	20
HAWAII	15	15	20	20	40	—	20	—	10(1)	10(1)	10	[illegible]
INDIA	20	—	—	—	—	—	15	15	—	—	—	—
JAPAN	—	20	20	—	—	20	20	—	—	—	—	20
MEXICO	15	20/40	20/40	20/40	—	20	10	10	10	10	10	15
PHILIPPINES	—	—	20(1)	—	—	20	15(1)	10(1)	—	—	—	15(1)
PUERTO RICO	15	20/40	20/40	20/40	—	20	10	10	10	10	10	15
SOUTH AFRICA	20	—	20	20		—	—	—	10	10	15	15
USSR	—	—	20	20	20	—	—	15	15	—	20	20
WEST COAST	20	20/40	20/40	40	40	40	10	10	10	10	10	15

CENTRAL UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	[illegible]	20	20	20	—	—	20	—	—	—	15	[illegible]
ARGENTINA	15	15	20	20	—	—	—	10	—	10	10	10
AUSTRALIA	10	15	20	20	20	[illegible]	20	20	—	15	10	10
CANAL ZONE	15	[illegible]	[illegible]	[illegible]	—	—	10	10	10	10	10	10
ENGLAND	—	—	—	—	—	—	—	15	[illegible]	15	20	20
HAWAII	[illegible]	15	20	[illegible]	[illegible]	[illegible]	20	—	—	10	10	10
INDIA	15	20	—	—	—	—	20	15	—	—	—	—
JAPAN	[illegible]	20	20	20	—	—	20	—	—	—	15	[illegible]
MEXICO	15	[illegible]	[illegible]	[illegible]	—	—	10	10	10	10	10	10
PHILIPPINES	[illegible]	—	20			—	20	15	15	—	—	[illegible]
PUERTO RICO	15	[illegible]	[illegible]	[illegible]	—	—	10	10	10	10	10	10
SOUTH AFRICA	—	—	20	—	—	—	—	—	10	10	15	20
USSR	—	—	20(1)	—	—	—	—	15(1)	15(1)	20	20	20

WESTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	[illegible]	—	20	20	20	20(1)	20	—	—	—	[illegible]
ARGENTINA	10	15	20	20	20	—	—	—	10	—	10	[illegible]
AUSTRALIA	10	10	15	20	20	[illegible]	40	20	20	—	10	10
CANAL ZONE	15	15	[illegible]	[illegible]	20	—	—	[illegible]	10	10	10	10
ENGLAND	—	—	—	—	—	—	—	—	15	15	20	20
HAWAII	10	15	15	20	[illegible]	40	40	—	15	15	—	10
INDIA	15	15	20	—	—	—	—	20	15	—	—	—
JAPAN	10	[illegible]	—	20	20	20	20	20	—	—	—	[illegible]
MEXICO	15	15	[illegible]	[illegible]	20	—	—	[illegible]	10	10	10	10
PHILIPPINES	15	—	—	20	20	20	20	20	20	20	20	15
PUERTO RICO	15	15	[illegible]	[illegible]	20	—	—	[illegible]	10	10	10	10
SOUTH AFRICA	20	20	20	20	—	—	—	—	10	10	15	20
USSR	—	—	—	20	20	—	—	20	15	15	20	20
EAST COAST	20	[illegible]	[illegible]	40	40	40	10	10	10	10	10	15

Note: (1) Possible on some days
use 10 for 10 & 12 meter bands, use 15 for 15 & 17 meter bands, use 40 for 30 & 40 meter bands. Where 2 bands are shown, try both. This data is for the highest possible frequency to be used of a given path (MUF)

JULY 1990

SUN	MON	TUE	WED	THU	FRI	SAT
1 P	2 P-F	3 P-F	4 P-F	5 P-F	6 P-F	7 P-F
8 F-G	9 G	10 G	11 G	12 G	13 G-F	14 F-P
15 P	16 P	17 P-F	18 F	19 G	20 G	21 G
22 G	23 G	24 G-F	25 F	26 F	27 F	28 F
29 F	30 F-G	31 G				

73 AMATEUR RADIO

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—P.C. Electronics 1250 MHz Downconverter
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LETTERS

From the Hamshack

Sam Taylor, Oroville CA: Your magazine is now and has always been the best amateur magazine because it has always had good construction projects. In the past there were priceless projects that are now lost in time. Keep up the construction projects because they help the availability of parts by creating a demand. (I am not a dealer but I do build a lot of projects that I pass on at cost to local hams.) If your editors would look back into those old issues they would find much that is still applicable to the state of the art. Maybe listening to high speed CW has affected my mind.

Les Delmarter WB6YIK, Terra Bella CA: What we need is an easier entry to amateur radio than the present Novice class license offers. The growth we are looking for in order to save amateur radio is going to come only from the kids, not the few engineers who would be attracted to the ARRL's Communicator license. Who would these people communicate with? The 220 MHz band will probably disappear soon, while the 440 MHz band is almost exclusively closed repeaters, control links and remote bases, and activity above 450 MHz is pretty sparse in most areas of the country. I think a Communicator Class license is a good idea, but it should fit into the current license structure. I feel that a Communicator class license that offered the current Novice voice privileges on 28.300-28.500 and 220 MHz and required nothing more than the current Novice written test would be very attractive to prospective amateurs. This license would be good for 10 years, renewable, and could be upgraded to Novice by simply passing the 5 wpm code test. No changes to the current Novice or Technician class license would be required. Let's keep things simple and give the kids a good reason to get involved in amateur radio.

Lawrence W. Joy WN8P, Olathe KS: Just read "Experimental Gaussmeter" and "Standard Magnetic Field Generator" in the June issue. The term gauss is deprecated. According to correct metric practice, and the way I learned magnetics, the terms to use are the weber (Wb) for magnetic flux and the tesla (T) for magnetic flux density.

Weak fields have to be measured in gauss or milligauss—the Tesla is too large, being 10^4 gauss. Calibration points on my meter would require a lot of zeros. 50 gauss equals 0.005 Tesla, for example. Earth's magnetic field varies from about 1 to 10 gauss. The Tesla is used primarily to describe very strong magnetic fields in the laboratory. 10 Tesla (a fairly weak laboratory field) is equal to 100,000 gauss, which is why the Tesla is preferred when referring to strong fields. The above complaint is akin to suggesting that 20.01 μF be expressed in farads. . . J. Frank Brumbaugh KB4ZGC, author.

Arthur S. Byram K0LKT, Pittsburg MO: I do not believe the interest of amateur radio is being served by the constant hammering on the subject of the wonders of NO CODE exams. Persons subjected to this constant complaint will be turned against code without even trying it. Like a child that hears others constantly saying that this or that is awful, the child will claim that they "hate that" even though they have never encountered it.

How many hams now operating mostly on CW had that in mind when they applied for a license? After having to learn the code, they found that it is a real enjoyable form of communication. Wayne is right that the method of learning the code has improved immensely, so what is the problem?

Without new blood in the CW portion of the bands, only the old-timers will occupy the frequency, giving commercial interests a great opportunity to file for the use of those frequencies.

I support the code system as well as paying a license fee so the FCC can do the job we expect them to do. Our country is not perfect, but it is the best in the world.

Doug Brown, Athens GA: I am a 20-year-old college student who, after 12 years of dreaming, just earned my Novice license. I am still delirious. I would like to say that all of the people in the Athens Radio Club were very friendly and helpful and genuinely interested in encouraging newcomers.

I would like to thank *73* for having excellent articles, especially entry-level articles. These are very helpful for anyone who is just starting.

Here is a little advice I would offer anyone trying to learn the code: If you have a computer, buy a practice program. They are cheap and thousands of times more effective than practice tapes, since you cannot memorize them.

Some news that may shock people: I attend one of the top journalism schools in the country. It has a heavy emphasis on radio and television. Not once has amateur radio ever been mentioned during a class. Ninety percent of my friends had never heard of ham radio before. The few who have heard of it have no idea what it actually is, but think I'm starting up a noncommercial broadcast station. I'm trying to spread the gospel, but how did things get this bad?

P.S. Does anyone have some REALLY cheap equipment a starving college kid could afford? (149A Mitchell Street, Athens CA 30605).

David T. Burr KK9L, Downers Grove IL: The recent DXpeditions by 3Y, 7O, and others have shown that hams are not the self-policing group they're expected to be. Most of the social misfits who intentionally QRM nets, DX operations, repeaters, and general QSOs MUST be known by some of the locals around them, yet nothing is done. Thus, the cuts in the FCC enforcement budget were predicated on a false assumption.

Unfortunately, there is an on-going RF spectrum crunch, and if the 99% of us who care about our hobby want to enjoy it down the road, something has to be done to show the FCC that we appreciate the PRIVILEGE of occupying our frequency space, as well as clean it up to make our operating enjoyable once again.

I am in favor of not only license fees for new licenses and renewals, but also an annual fee of $20-30 to maintain our licenses. This would put $10 million into the enforcement budget (after administrative expenses) and have obvious positive effects. It is ironic that the old geezers who fill these pages with complaints about what the no-code license will do to the "quality" of operators are the same ones who would be first to resist this proposal. Just about anyone who maintains any sort of station could afford this little fee, and those who claim poverty could simply send a copy of their 1040 to the FCC and the fee could be reduced or waived. Our hobby is changing and if we want to enjoy it in 10 years we cannot continue to stick our heads in the sand. Anyone out there want to help save our hobby?

Walter A.L. King N3EID, Hellertown PA: Everyone is saying or should be saying, "What should we do to get more people involved with amateur radio?" and it is being said so much that a lot of folks are getting turned off about the idea. I know I was until something happened here.

I have lots of grandchildren and when they visited they avoided my "radio shack." Three of the grandchildren are boys ages 6, 8 and 10. I got to thinking how I started with radio and then it hit me . . . a crystal set . . . I built it and used to lie in my bed at night and listen to WLW in Cincinnati, Ohio. Some nights the signals were so strong you could hear the music across my bedroom!

So I started looking around for parts for a crystal set. They aren't easy to locate. But I did find a source—The National Supply Division of the Boy Scouts of America. I ordered three sets, which came in a few days. They don't have a diode with a germanium crystal fused into it.

All three grandsons took time to build a set, with Granddad there to help. The big moment came and everything went according to plan. Now each has a set in his bedroom at home. Mother is happy because they can't blast her out of the house with this type of radio. When the boys visited recently, they asked to go into the radio shack. Then one asked when will I teach them Morse code!!! It is a start. You gotta get them when they are young.

You can buy the set from the National Supply Division, B.S.A. at (800) 323-0732. The Crystal Set Radio kit is catalog number M-1731 and the cost is only $5.96. They accept Mastercard and Visa. At that price, why not buy several for others?

What about the granddaughters? Many girl children get the message very early in life that when it comes to machines and technology, this is something they would not be interested in, and that they should stay out of the way, especially if something is being fixed. . . Linda KA1UKM

Al Mehner W7HP, Las Vegas NV: Wayne, we both share our love of ham radio. I have spent time in the U.S. Signal Corp, U.S. Army Air, U.S. Coast Guard, and U.S. Maritime SVC—most of it pounding brass. I have been shot at, bombed at, and torpedoed at. I have intercepted Kata Kana prior to WWII, sent a peacetime SOS, told an admiral to . . .

I have lived a long and happy life which is now drawing to a close.

I owe it all to ham radio.

I could not care less about the code–no-code conflict, but what ham radio needs is quality, not quantity.

We need the kids as young as we can get 'em, the younger the better. One young inquiring mind is worth a dozen appliance operators.

My schoolteacher wife took a handful of my foreign QSLs to her classes and encouraged the kids to write to the stations. The kids were deluged with letters and pictures of other kids.

I don't know how many of our young can read or write, but am sure that some of them can.

If you would, ask your *73* readers to give or loan cards to interested teachers and perhaps become elmers, it just might help.

My elmer was W7BB Ed Stevens. He was killed while flying his own plane, about 1946.

James Whitfield N5GUI, Aledo TX: Your June '90 "de K6MH" column provided me with a possible link to information I have been seeking. Please pass the information along to Mike Nugent WB8GLQ.

I have a Radio Shack WP-2 laptop word processor and the Portable Disk Drive (same as used on the Model 100). The WP-2 instruction book tells how to load and run program files to use it like a "real computer," but I have found no software for it and have not found a way to create a program file in the word processor. Perhaps *Portable 100* magazine can help me. If not, can you refer me to a group or magazine that can?

The WP-2 is a nice, small, clean package that has an RS-232 interface for disk drive, and parallel printer port. Assuming the program problems are readily solved, it would make a great packet/portable component, and that would be a great article for *73*, even if the interface was a repeat of similar units for the Model 100.

For now, programs must be written on another system (a PC, for example), and then ported over. The WP-2 Service Manual (RS #26-3930) gives some—though hardly complete—programming information.

At least one company is developing application software (not yet released and non-ham anyway), but until someone develops a language interpreter, assembler, or compiler, there's no way to program on the WP-2 itself.

Some of the whiz-kids on CompuServe's Model 100 Forum (M100SIG) have been WP-2 hacking. Check out their special section for WP-2 messages and files. It's the most up-to-date source of info I know.

Portable 100 magazine, which covers all Tandy laptops, thoroughly reviewed the WP-2 in November 1989. Advertisers offer 32K and 128K expansion RAM chips, software for easy file transfer between WP-2s and PCs or Macs, and a buyer's guide full of good info. A monthly WP-2 column starts soon, and a WP-2/packet article has been assigned. (I'll see if we can spin it off for 73, too.) Contact Portable 100 at P.O. Box 428, Peterborough NH 03458. Tel. (603) 924-9455. The Portable 100 BBS has just added a ham radio section. Phone (603) 924-9455, stats 300/1200, 8n1. Anyone's welcome anytime.

. . . Nuge WB8GLQ

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73 AMATEUR RADIO®

AUGUST 1990
Issue #359

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NEVER SAY DIE

Wayne Green W2NSD/1

Solving The DXCC Mess

The DXCC award has turned out to be one of the more pernicious and destructive forces in amateur radio. It doesn't have to be. We *can* have our cake and eat it too, to coin a cliche.

If you've isolated yourself on the two meter amateur radio backwater for years, being too busy to spend a few minutes a day for a couple weeks learning the code at 13 per, you've resigned yourself to second class ham citizenship as a Tech, and thus may know little of the awful mess the ARRL's prestigious DXCC award has made of our hobby.

One of the four supposed legal reasons for amateur radio's existence is our ability to generate international good will. The concept is wonderful. Amateur radio provides a means for people-to-people communications around the world. Alas, DXCC has turned our DX bands into aggravating messes. . . with pileups, lists, tail-ending, etc., making life almost impossible for any ham in even a moderately rare country.

Having operated from several fairly rare spots, and having talked personally with amateurs in many more, I know firsthand what I'm writing. Yes, I had fun working thousands of DXers when I was visiting rare countries. . . operating contest-style and knocking off several QSOs a minute. It's an exciting experience and one I recommend for any red-blooded ham.

How rare? My first taste was in 1958 when I went to Navassa Island (KC4AF). Wowie, was that fun! In 1959 I operated from Aden, Pakistan, Ceylon, Vietnam, Wake Island and other rare countries. Since then I've been on from Syria, Lebanon, Jordan, Iran, Afghanistan, Kenya, Swaziland, Lesotho, Nepal, Singapore, Sarawak, Sabah, New Caledonia, Fiji, Western Samoa, Tahiti, St. Pierre, and many others.

What I found when I visited rarer countries is that the amateurs living there have been virtually forced off the air by DXers. DXers, driven by the "need" for a QSL, won't permit amateurs in rare countries to enjoy relaxed contacts. They immediately start tail-ending, then breaking in and clobbering the QSO, not to talk with and get to know the amateur, but just to get a signal report and that card. If the DX op tries to ignore these pests, they get more and more abusive and frantic.

The result is that the few hams who manage to get on the air in Third World countries quickly get fed up with this nonsense and take up a new hobby. International friendships? Darned few! This is particularly frustrating for the DX op, who often has invested a tremendous amount of time and money in getting on the air. . . only to be chased back off by DXCC fanatics.

Contest-style operating can be fun, but not if that's all you ever are allowed to do. It means keeping a detailed log, writing out endless QSL cards and mailing them. The postage involved is horrendous, so most DX hams tend to use QSL managers. This is fun?

If you don't think the chickens come home to roost on this one at the WARC ITU conferences, you've got your head in the sand. We have a powerful vested interest in generating as much support from Third World countries as possible. And guess who gets sent to Geneva for the WARCs? The same chaps we've hounded off the air.

Well, heck, you can't stop hams from collecting countries, right? Even if we didn't have a DXCC, we'd still be looking for the rare ones. Maybe, but the pressure to get on the *QST* Honor Roll is a powerful motivating force. I've known DXers who've built their lives around this farce.

I remember one DXpeditioner who charged Honor Roll hams a hundred dollars for every new country he gave them. He made a business of DXing and did very well at it. The contributions all came by mail in cash, so he paid no taxes on it. He bragged he was making over $150,000 a year this way. . . and I believe it. I knew him well.

Okay, how can we stop all this nonsense and make it so amateurs who manage to get on the air from a rare spot can actually talk with us? How can we take off the Honor Roll and DXCC pressure? The solution is so simple, it's ridiculous. I should have thought of it years ago.

I was talking with the ARRL's DXCC manager at Hamcom in Dallas, when it struck me! Why not make contacts for DXCC credit only count when made during accredited contests? After all, most contacts with rare countries quickly degenerate into contest-type contacts anyway.

How do we stop some fool contest-oriented magazine from trying to run 52 weekly contests? We might suggest to the League directors that they limit QSL credits to a maximum of six contests a year. We certainly don't want our bands turned into unholy messes every weekend.

This would cut down on QSL costs. DX ops would only have to submit their logs to the ARRL. . . preferably on a floppy disk. . . and a computer could do the rest.

By making it so contacts other than during contests would have no award value, we might eventually make it so Third World amateurs will be able to actually get on the air and enjoy interesting contacts.

I've visited these countries and I can tell you that our demand for QSL cards has left a long trail of bitter, angry Third World hams. . . just what we don't need at world administrative conferences when our ham band allocations come up for grabs.

By concentrating our DXing into a half dozen weekends a year we'd encourage more DXpeditions to be organized. And we might find the hams in the rare countries getting on for some contest operating and enjoying it.

But what about the ten kilowatt overbearing DXer who will kill for a new country? If the DX ops will use my system of making contacts they'll frustrate the hell out of ugly DXers and make it so even QRP and mobile hams will be able to get through. Further, we'll avoid ghastly messes such as the recent Bouvet Island debacle.

Unless you know some DXers you may not realize how much this seemingly insignificant aspect of our hobby can dominate their lives. These are not ordinary hams. They have huge towers, several kilowatts, two-meter spotting nets, and DXing comes first. . . before work, family, even eating. They have their hundred or so rarest QSL cards in their coat pocket at every ham club meeting, ready to whip out and amaze you.

When a rare one comes on they drop everything until they've made at least two contacts (one for safety). Some true fanatics have to do this on five bands. . . and every mode. How about a CW contact now, OM? If a new country came on using only slow-scan TV, they'd rush out and buy an SSTV system just to make the contact. . . and preserve their Honor Roll listing.

You see, if their Honor Roll competitors get a new one and they don't, it's unlikely they'll ever get back where they were on the list. This is why some DXers will spend a thousand dollars to get a new one, if that's what it takes. This is why their QSLs go out with "green stamps" in the envelopes. Heck, I remember when they sent only a dollar, now it's usually a ten or a twenty.

So let's get the ARRL to make a major move toward cleaning up our bands by allowing DXCC credits only for contacts made during specific contests. How do you do that? Write to David Sumner at HQ, to Price, the president, and to your director. Explain it clearly in terms a director can understand . . . no change in the DXCC rules,

Continued on page 79

QRX . . .

Emergency Connections and Kit

The ability to easily interchange equipment between stations may be crucial in an emergency. All stations active in the Amateur Radio Emergency Service (ARES) should use a common type of power connector throughout their stations, or they should keep an adapter on hand. Dick Rawson N6CMJ, writing in the June issue of *Electronics Museum* ARC newsletter, suggests Molex™ 2-pin (0.093-diameter pins), 12-amp connectors with a contact resistance of 0.0025 ohms, 2.5 mV/A. However, this connector is not suitable for long-term outside use because it is not weatherproof.

Make sure that polarization is the same from station to station. The POSITIVE pin is on the FLAT side of the connector, and the NEGATIVE is on the POINTED side. *[Ed. Note: Standardization is important between stations because some hams use an opposite polarity arrangement, myself included].* The source side of the connector (from the power supply) is the MALE housing, with the FEMALE pins to be installed. The radio side is the FEMALE housing, with the MALE pins to be installed.

Waldom Part No. 1545PRT, a package of three sets, contains Molex parts 03-09-2021 (plug), 03-09-1021 (receptacle), 03-09-1118 (female pins), and 03-09-2118 (male pins). Radio Shack's one-connector set is #274-0222.

In the May issue of the above newsletter, the editors state that rubber duck antennas and NiCd battery packs are severe handicaps during a prolongued communications emergency. NiCd batteries last only a few hours, so your emergency communications kit should include some alkaline batteries. As for antennas, you can quickly attach a J-pole 2m antenna to a school flagpole and hoist it up 30 feet, or throw it up over a tree branch with some nylon rope and a rock *[look carefully before you throw]*. A small generator or a deep cycle 12-volt battery can keep your 2m and HF radios operating when the power is out.

In addition to the right connections mentioned previously, your kit should contain: adapters, extra coax with fitting, AC power supply, large alligator clips on a power cord for using a car battery, and a high capacity (800 mAh) NiCd pack for your HT. A magnetic mount antenna and power cord with cigarette lighter adapter and a pair of earphones can come in handy, too.

KB5AWM and KB2IGG Receive Awards

On June 9, 1990, James "Jim" Heil KB5AWM received the 1990 Amateur Ambassador Award at the ARRL National Convention in Kansas City, Missouri. Mike Lamb N7ML, president of Advanced Electronic Applications, Inc., presented the award.

AEA presents the award yearly to the radio amateur who demonstrates extraordinary efforts in promoting the amateur service to individuals new to amateur radio. Jim Heil was chosen because he has organized and taught numerous Novice classes, elmers new hams, and has served as a VE and VE coordinator.

As ARRL Public Information Officer, Jim has managed to get an amateur radio announcement on the local cable system and write articles about ham club activities and amateur radio for the local newspapers. With the Clear Lake Amateur Radio Club (CLARC), Jim helped donate books on amateur radio to the local library.

Since becoming licensed in 1986 at the age of 18 (and upgrading to Extra Class the following year), Jim helped establish CLARC, which has grown from seven to over 130 members, and he edits the club's newsletter, the *CLARC Chronicles*. For two years, he was vice-president of CLARC. He is a member of Skywarn, RACES, and ARES, and assists in public events that can benefit from amateur radio. Jim, a full-time student at the University of Houston at Clear Lake, is pursuing a degree in computer information systems.

Former recipients of the AEA Amateur Ambassador Award include Mary Duffield WA6KFA, Barry Goldwater K7UGA, Byron Lindsey W4BIW, and Bob Wallar WB6QNR. AEA will accept entries for the 1991 award through May 1, 1991. All entries must include an outline of the nominee's activities in three categories: dedication to amateur radio, positive influence on those outside of the Amateur Radio Service, and initiation of special projects or programs to promote amateur radio. The recipient of the award receives $1,000 and an expense-paid trip to the ARRL National Convention. Send entries to AEA, Attn: Amateur Ambassador Award, P.O. Box 2160, Lynnwood WA 98036.

Twelve-year-old Mary F. Alestra KB2IGG, featured in "Ham Profiles" in the February 1990 issue, was named the 1990 *Westlink Report* Young Ham of the Year. The award, a plaque detailing her accomplishments, was presented to Mary by Burt Hicks WB6MQV, *Westlink* publisher, and Bill Pasternak WA6ITF, contributing editor of same, at a banquet also on June 9 at the ARRL Convention. As part of the award, Mary received an all-expense paid trip to the Convention and new radio equipment from Yaesu, a complete set of amateur radio training materials from Gordon West WB6NOA, and a three-year subscription to *73 Magazine* compliments of Wayne Green W2NSD.

Mary, a student of Rocco Laurie Intermediate School in New York City, was chosen to receive this award because of her many accomplishments in amateur radio in the short time since first exposed to it by Carole Perry WB2MGP (see Mary's interview with Carole in the May issue). Interested in other cultures, Mary has discovered the joys of contacting people all over the world, as well as locally. Using borrowed radio equipment, on bus trips she has kept hundreds of students, some of them out of state, in contact with the school principal and hams who could help in case of mechanical problems or emergencies.

One of Mary's favorite ham activities is participating in the "CQ All Schools Net," a hookup of dozens of schools around the country. Mary has developed a high level of competence in handling traffic, and her skill at operating various types of radio gear often astounds the more experienced devotees of the hobby. Her irrepressible enthusiasm is quickly communicated to her classmates, and she enjoys helping them get started in amateur radio.

Mary says that amateur radio has helped her greatly in her school work, especially in geography and social studies, and that she is becoming increasingly interested in the scientific and experimental aspects of ham radio.

For nominating Alestra, Carole will be given a complete set of all currently available amateur radio promotional and educational videotapes produced by Roy Neal K6DUE, Frosty Oden N6ENV, and Bill Pasternak WA6ITF from *Amateur Radio Newsline*.

Past winners include Erin McGinnis KAØWTE (1989), Jonathan Binstock NK3D (1988), David Rosenman KA9PMK (1987), and Shawn Alan Wakefield WK5P (1986). TNX *Westlink Report* and *AEA*.

Get Beady for More RFI

OTH-B, the Over the Horizon Backscatter radar system with transmitters in Moscow, Maine, and receivers in Columbia Falls, Maine, is only the first of four such systems to be built. A system spanning California, Idaho, and Oregon is now 90% complete. The central system will be based in North and South Dakota, and Minnesota. The fourth system will be in Alaska. OTH-B has a range 10 times greater than that of conventional radar, and will be useful in detecting small drug-smuggling planes as well as serving as an early warning system.

OTH-B is also known as the "woodpecker" because the interference it causes in shortwave communications resembles the rhythmic pecking of this bird. According to GE, the builder, the transmissions will include the following frequencies: 5 MHz (what about WWV?), 6.74–9.09 MHz (40m?), 9.09–12.24 MHz (30m?), and during the day, 12.25 to 16.50 MHz (20m), 16.50 to 22.25 MHz (18m and 15m), and 22.25 to 28 MHz (possibly affecting the 24 and 10m bands). And now Japan and Australia are also interested in setting up their own OTH-B radar systems!

However, Kokusai Denshin Denwa Co., Ltd. in Japan has developed equipment which almost completely eliminates "woodpecker" interference without using noise-blanking methods. At present, this new equipment is only used on ship telephones, but amateur radio use is under consideration. TNX *Crosstalk*, newsletter of the TRW ARC, *The JARL News*, and *Amateur Radio Newsline*.

TNX again . . .

To all our contributors. You can reach us by phone at (603) 525-4201 or by mail *73 Magazine*, Forest Rd., Hancock NH 03449; on CompuServe ppn 70310,775; MCI Mail "WGEPUB"; GEnie, "MAG73"; and the *73* BBS at (603) 525-4438 (300-2400 bps), 8 data bits, no parity, one stop bit.

Number 4 on your Feedback card

Omni-Gain Vertical Collinear for VHF and UHF

Coax comes alive II, the next generation.

by Mike Coilis WA6SVT

This rugged antenna, an omnidirectional collinear, is capable of surviving harsh environments. It's a good choice for repeater installations and it can be easily top- or side-mounted to the tower. You can obtain approximately 3–10 dB gain over a dipole, depending on the number of elements you use. The higher the gain, the narrower the elevation pattern. Bandwidth is normally 10 MHz on the 70cm band and 25 MHz on 23cm, making the antenna an excellent candidate for ATV repeater use. Many improvements have been made since my original article, "Omni-Gain: Collinear for 70 Cm and 23 Cm," was first published in the May 1982 issue of *73*.

The main elements are constructed from ½-wavelength sections of coaxial cable. You can calculate the element length using the formula of 5904 divided by the frequency (MHz) times the velocity factor of the coaxial cable. In my original article, I used RG-213 with a velocity factor of 0.66. I now use RG-11 or CAC-11 (a solid conductor aluminum shield cable) for high power antennas and RG-6 for low power.

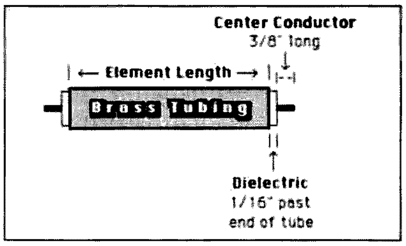


Figure 1. Element preparation.

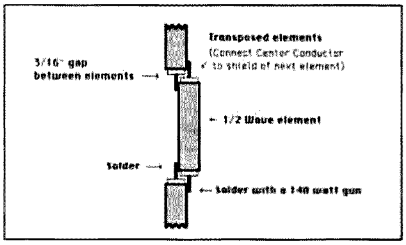


Figure 2. Element assembly.

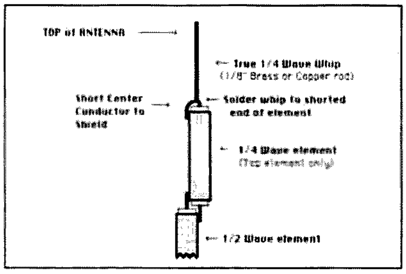


Figure 3. Top section of collinear.

To begin construction, remove the jacket and shield from each element and slide it into hobby brass tubing. Select the diameter of the brass tube to just fit snugly over the dielectric of the coax. The brass tube provides a more rigid support for each element and makes it easier to solder them together. Use the above formula to calculate the lengths of the brass tubes. Cut the coax segment long enough to allow 1/16" of the dielectric and ⅜" of the center conductor to extend past each end of the tube. Make as many ½-wave elements as needed for the gain you desire: 4 elements = approx. 3.5 dBd; 8 elements = 6 dBd; 18 elements = 9 dBd; and 21 elements = 10 dBd. In addition, you need a ¼-wave element and a ¼-wave whip for the top of the antenna. The whip is cut to a true one-quarter wavelength (no velocity factor correction) and is made out of number 12 wire or ⅛" brass rod. *[Editor's note: If brass tubing is unavailable, you can leave the shield and jacket of each element intact. Cut the shield to the formula length and remove enough of the jacket to allow soldering.]*

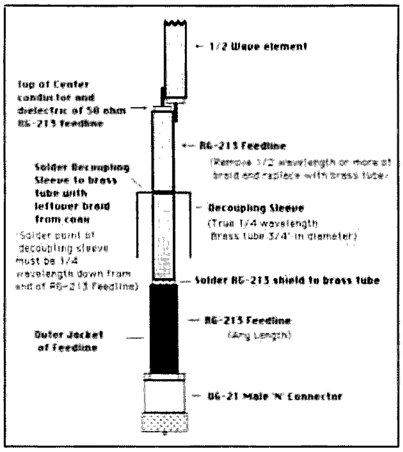


Figure 4. Feedline attachment and decoupling sleeve.

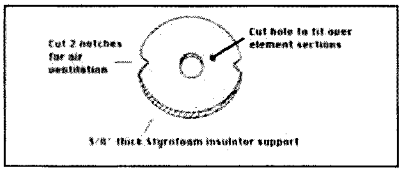


Figure 5. Styrofoam spacer (3 or more needed).

Constructing the Collinear

Step 1. Determine the length of the ½-wave elements (brass tube or coax shield) using the following formula: 5904/F (MHz) x Velocity Factor. Use the manufacturer's velocity factor for the cable you plan to use. Solid polyethylene usually has a velocity factor of 0.66 while foam cable ranges from 0.79 to 0.83.

Step 2. If you desire a downtilt, cut the elements 2% shorter than calculated in Step 1. See Figure 6a for elevation patterns.

Step 3. Cut lengths of RG-11 (or RG-6) coax approximately ¾" longer than the element tubing.

Step 4. Remove the outer jacket and shield and slide the dielectric and center conductor into the brass tube.

Step 5. Using a knife, cut the dielectric so that it sticks out 1/16" past each end of the brass tube. This should leave approximately ⅜" of the center conductor exposed on each end. See Figure 1.

Step 6. Solder the center conductor of each element to the outer conductor of the next element, making sure to keep the whole antenna as straight as possible. With a small wire wrapped around the tube, you can hold the center conductor in place next to the brass tube. After soldering, remove the ends of this wire with cutters. See Figure 2.

Step 7. The last element is ¼-wave long, exactly half the measured length of the ½-wave element. Short out the top end of this section by bending over the center conductor and soldering it to the brass tube. The ¼-wave whip is attached at this point. The whip is a true ¼-wave (no velocity factor correction) and can be contructed out of any diameter brass rod. See Figure 3.

Step 8. The 50 ohm feedline can be any length. I used RG-213 or 214 coax with an N connector attached. Strip off at least a half wavelength of the shield on the other end of the feedline. Leave about an inch of the shield sticking out of the vinyl jacket. Cut back the dielectric to expose ⅜" of the center conductor. Slide a half-wave or longer brass tube

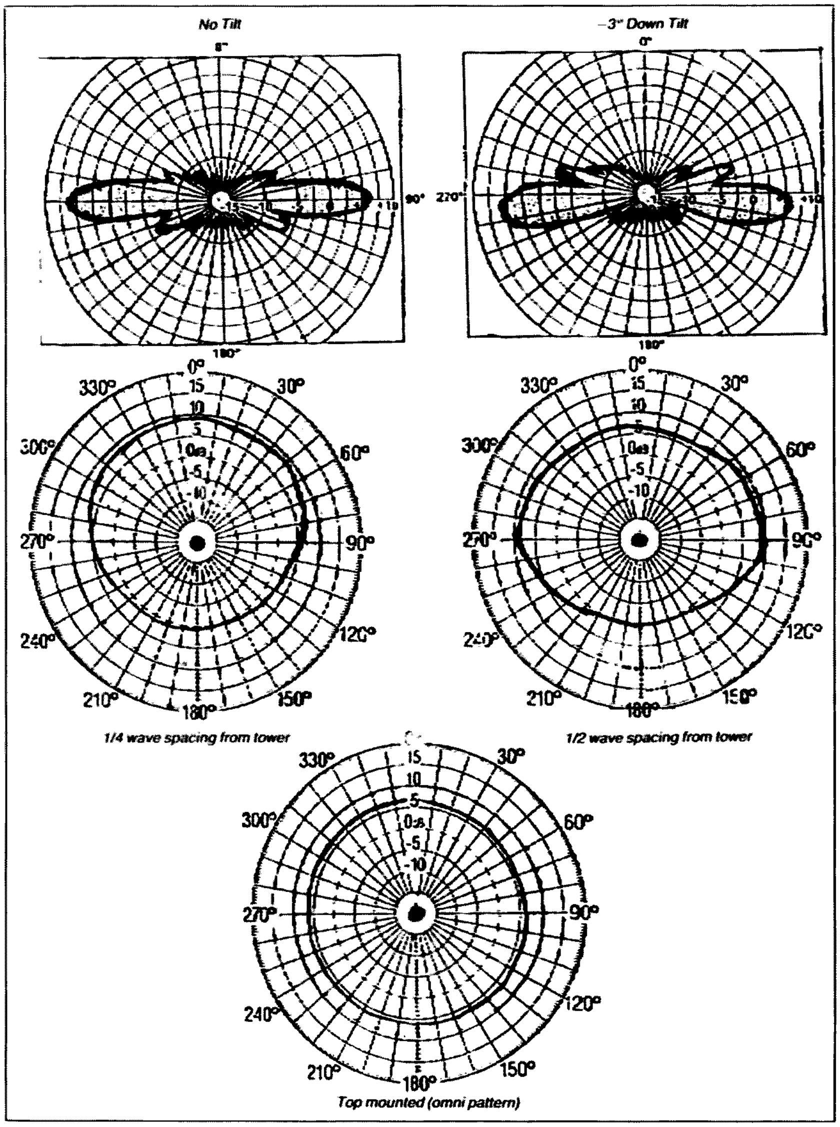


Figure 6. a) Elevation patterns for 6 dB antenna; b) Azimuth patterns for 6 dB antenna.

over the end of the feedline so that the 1" length of braid can be placed over the bottom of the tube. Solder the feedline braid to the bottom of the brass tube.

Step 9. Next, make a true ¼-wave (no velocity factor correction) long decoupling sleeve out of a ¾" diameter brass tube. Using some of the excess shield material, solder the decoupling sleeve to the feedline outer conductor at a point exactly ¼-wavelength down from the point where the feedline attaches to the antenna. See Figure 4.

Step 10. Attach the exposed end of the feedline to the bottom of the collinear (center conductor of feedline to outer conductor of the antenna).

Step 11. Make at least 3 styrofoam spacers to slip over some of the antenna elements. Cut the spacers for a diameter slightly less than the inside diameter of the radome pipe. Space them out to evenly support the antenna when you place it in the fiberglass (or PVC) radome cover. The spacers should be attached to the midpoint of the element with a small amount of epoxy. See Figure 5.

Step 12. Cut a piece of fiberglass pipe (or PVC) so that 18 inches or more extend past the top of the whip and below the decoupling sleeve. Slide the antenna carefully into the fiberglass pipe and cap off the top of the pole. Drill two holes near the bottom of the radome pipe and pass an insulated wire through and around the feedline (below the decoupling sleeve). Twist the wire until it holds the feedline tightly against the radome cover. Place another styrofoam spacer on the very end of the pipe and glue it in place. Make sure to poke a few small holes or notches in the spacer to allow the end of the antenna to breathe. You're now ready to fire up your collinear! See Figure 7. *[Ed. Note: You can obtain economical fiberglass tubes custom made to your dimensions from: Lightning Bolt Antennas, RD #2, Route 19, Volant PA 16156. Telephone 1-412-530-7396].*

Tune Up and Operation

Find a clear area, free of obstructions, in your back yard. Mount the antenna to a pole, making sure to clamp the antenna to the mast at a point below the decoupling sleeve area. Attach a wattmeter or VSWR meter at the antenna. If the SWR is over 1.5:1 you can adjust the decoupling sleeve slightly up or down the feedline for the best reading.

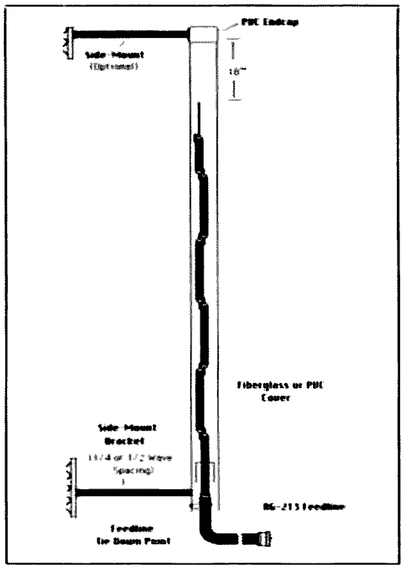


Figure 7. Completed collinear (four ½-wave elements).

If you've designed the antenna for a downtilt, you can check it by observing the signal strength of a nearby repeater. Tilt the antenna until the signal peaks, then measure the angle of tilt with a protractor. If it checks out, you're ready to mount to your tower!

Mounting the collinear on top of your tower will give you an omni-directional pattern. If you desire a cardioid pattern, or if your only option is side-mounting, you can mount the antenna to the side of the tower with one or two brackets. Make sure the bottom support is attached to the antenna below the decoupling sleeve, and that the top support is mounted 18" or more above the top of the whip. Mounting the collinear ¼-wavelength away from the side of the tower will give you about a 2 dB increase in the frontal lobe of the pattern. A spacing of ½-wavelength will increase the signal 2 dB at 90 degree angles to the frontal lobe. Both patterns give a null in the direction of the tower. See Figure 6b.

This antenna should handle the worst Mother Nature can throw at it. It has performed admirably at the ATV repeater site on 5670-foot Santiago Peak for many seasons. Mounted on the tower, it blends right in with the commercial antenna installations. Apparently it was convincing enough to attract antenna marauders, as it was recently stolen! Guess it's time to design the Mark III version complete with a burlar alarm. . .

Mike Collis WA6SVT is active on amateur television (ATV) in the Los Angeles area and works as a communications supervisor for San Bernadino County. You may reach him at P.O. Box 1594, Crestline CA 92325.

High on ATV

A marriage made in heaven!

by Earl Campbell KS8J

On November 12, 1988 several ATV firsts were accomplished during the Thunderbird Hot Air Balloon Race over Phoenix, Arizona.

Actually, I had more on my mind that day than ATV. This was THE day for Tommy N7KBO and me. It started out with my betrothed mentioning that she had never had a ride in a hot air balloon. "Well," I said, "how would it be if we got married in one?" The rest is history: she accepted and we did. After much planning and coordinating with countless members of the ham radio/ATV community and balloonists, our hot air balloon wedding was held at sunrise on that November morning.

What a view! What a ride! What a crowd! It's not every day you have a couple getting married in a hot air balloon over Phoenix with 30,000 people watching. We had ministers fighting over who was to perform the ceremony. This was not only the first balloon ride for the bride, it

Photo A. Tommy N7KBO and Earl KS8J prepare to float on the air.

Photo C. The nervous groom forgets to lower the antenna.

was also the first hot air wedding for both the minister and the balloon pilot.

To add to the event, the ceremony was broadcast over ATV to the witnesses and crowd below. In addition, Norm WV7K and Wayne N7MAO sent back pictures of the ceremony from yet another camera angle from a nearby balloon. This was the first balloon-to-balloon two-way contact while in flight, and the first broadcast of a wedding over ATV. Soon after launch I was to lower the Ringo Ranger strapped to the side of the basket but in all the excitement I neglected this detail. Not that it mattered much as the signal was snow-free anyways all over Phoenix. We had reports that people were tuning their cable TV boxes to our frequency and watching from their houses. The flight lasted over two hours and we came within 300 feet of the target in the "hare and hound" race. That's right—we were in the race, to boot! (We didn't win the race but I won the best prize of the event.)

For my wife, who endures all the crazy doings of the local ATV club, this was just a normal thing our group in Phoenix seems to do. The local AAA5 club (Arizona Amateur A5 club) and all the others who saw the event were glad to see the exposure ATV experienced from this event. My wife and I are very active in the AAA5 club here in Phoenix and wish to thank everybody involved for the most enjoyable day of our lives.

I know many of you 73 readers will say, "What will those young ham radio people think of next?" Well, think again about this "young" couple. We have six children and nine grandchildren. We flew them all to Phoenix to attend the wedding. The rest of the wedding was very traditional! The bride wore a long white gown, the groom wore a white tuxedo and the couple walked down a white aisle under an archway created by a flag corps to the tune of *Here Comes the Bride* played by a trumpeter. All of this at 6 a.m.!

Think of all the unusual things that can be done with ATV! 73

Photo B. Ready for liftoff.

Photo D. The bride gets ready to throw the bouquet.

Photo E. The wedding drifting toward heaven.

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

Number 6 on your Feedback card

HAM PROFILES

There are no "average" hams!

Music, Writing, Business—and Ham Radio

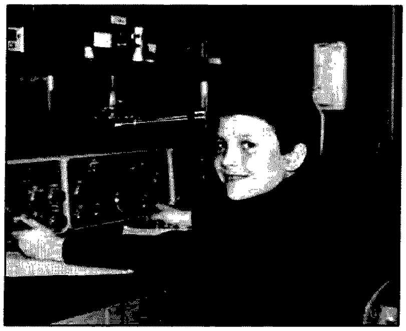
Dwight Kalita, Ph.D., ND8Y composes music on his Yamaha HX-1 synthesizer, co-authors books with doctors, runs his own business, enjoys DXing, and sees an enormous future for amateur radio.

Dwight ND8Y has been a ham for 30 years, since he was 13 years old. He and a couple of friends became interested in amateur radio when they were in high school, and an elmer helped them get started. To Dwight ND8Y, active in the Defiance County ARC, amateur radio is a valuable way to make lasting friendships in the community and all over the world. He's worked 323 countries. "Competing in amateur radio develops skills and a background in electronics," he says, and he's passing his knowledge on to his children. KB8AYB, his 10-year-old son, became licensed at the age of six. The five-year-old isn't ready to take time off from baseball yet to study amateur radio, but he'll have plenty of help when he does.

Dwight Kalita is president of Midwest Microcomputers, his own business, which sells NEC computer printers. With satellite operation, the space shuttle, and packet, he says his hobby is now becoming part of his business, and he's very excited about that.

In conjunction with doctors, ND8Y has co-authored books on health and nutrition, such as *Victory Over Diabetes, Brain Allergies, Nourishing Your Child*, and the *Physician's Handbook on Orthomolecular Medicine*.

As a musician, his *Kalitascope of Synthesizer Music* CD is one of the best sellers of Music New Hampshire. After about a year and a half of a lot of "work, fun, and love" ND8Y sent his 44.1 kHz DAT recording tape to Wayne Green and "hit a home run."



New Rig Needed—Maybe Two!

Andy Robinson KA3WDW is one of the newest and youngest hams on the air. This nine-year-old passed both code and theory exams for the Novice Class license on his first try. Andy says he wants to work on his WAS and DXCC now. His father, George Robinson WA3LVR, says, "Looks like I better think about replacing my 16-year-old Heath gear. Between Andy and me, there's going to be a lot of hours put on the rig."

Andy's father promised him that if Andy passed his Novice, he would take his Extra. So guess who has his nose in the Extra study guide? "This is definitely what I call incentive licensing," says WA3LVR, "and it is my pleasure to be doing it!"

Andy KA3WDW turned nine on March 1 and passed his Novice exams on March 21. He's in third grade in Beaver Creek Elementary School. Besides ham radio, he also enjoys playing Little League baseball. He plays third base and outfield for the Caln Minor A Phillies.

Currently, Andy is studying for the Technician Class exams, and he says he wants to go all the way to Extra. "I can't tell you how proud I am of him," his father says. "It's a lot of work for a nine-year-old. I hope he gets as much enjoyment out of ham radio as I have."

Meanwhile, in Alaska

Last winter, Jack R. Bitzer NL7SX successfully elmered his three children, Bryn, Elizabeth, and Sarah. For several months they used the Commodore 64 computer and a Morse cartridge to learn and practice code, and the ARRL's *Tune in the World*, accompanied by coaching from their mother, to study theory. They also used the code tapes that come with *Tune In*. W5YI examiners Mary KL7JEF, Bob KL7NC, and Gene AL7KH gave the children their Novice exams last April. Now the three are also known as Bryn WL7BXQ (11-years-old), Elizabeth WL7BXR (10-years-old), and Sarah WL7BXS (11-years-old). It wasn't easy, but the children are glad they did it! Their Novice licenses expire on April 17, 2000.

Sarah's first QSO was with Trevor VK4AFL in Brisbane, Australia. This has stimulated her interest to learn more about other cultures and places.

Bryn's first contact was QRP with AL7KH, four miles away. Later, he enjoyed a trip with NL7SX to string a wire between two mountains, and it sounds like he might enjoy more such expeditions.

Elizabeth's first QSO was with 14-year-old Jonathon KA5LXA in Baton Rouge, Louisiana, quickly followed by Jonathon's elmer, Doug KA5YSY, then Doug's wife, Judy KB5ACA. Elizabeth types 25 wpm, and she's presently observing the operation of BBS KL7NC for possible packet operation, as soon as KL7NC puts a transmitter on the 10m Novice band this summer.

The children use an HTX-100 and ICOM 735 for 10m USB, and a DX-60 B transmitter and DX-302 receiver for 80m, 40m, and 15m CW.

Jack NL7SX, who has been a ham since he was sixteen, and his three children are four of the nine hams in Ketchikan.

Low Power Two Meter FM Transmitter

Inexpensive, lightweight and expendable!

by Carl Lyster WA4ADG

After my balloon flight honoring the 20th anniversary of Apollo 11, I decided to design a simple 2 meter FM transmitter that could be built cheaply enough to be considered expendable. It needed to be lightweight, to provide a few hundred milliwatts output at best and be reproducible with few headaches. The circuit described here meets all of these requirements and performs better than my expectations. The complete unit measures 2" x 4", weighs under two ounces, provides 225 mW of output and is rugged and stable over a voltage range of 9 to 12 VDC.

When designing this device I chose several components that I knew from previous experience would perform well at 2 meters: a 2N3866 transistor for a final, 2N5179s for the multipliers, double-tuned toroidal forms for the tanks, and an X12 frequency multiplication scheme that would allow the use of Drake TR-22 type transmit crystals (low-cost and easy to order).

The circuit went through many revisions as I attempted to simplify the test equipment needed to tune up the transmitter. I spent many days in front of a spectrum analyzer trying to optimize the values of the tuned circuits to prevent accidental generation of spurs. The value of each resonant inductance was chosen so that the associated trim cap would be unlikely to resonate on the wrong multiple. This transmitter is not foolproof but it should be easily adjustable by anyone with patience and some good luck!

Audio Section

The transmitter requires a 6 Vp-p audio input level to obtain 5 kHz deviation. It was originally designed to interface directly with my digitized voice ID circuit in *Ham Radio*, Feb. '89. However, if you want to use a microphone or other low level audio source, use the circuit in Figure 1. This audio amplifier provides the necessary 6 Vp-p output while consuming only 2 mA from the 12 volt supply. Two sections of an LM324 quad op-amp are used to implement the amplifier. The first stage is set for a gain of 40 and is capacitively coupled by C2 to potentiometer VR1 which controls the overall amplifier gain. The second stage is set for a gain of 6 and its output is fed directly to the transmitter through a low-pass filter externally mounted between the audio amplifier and the transmitter input (C12 and R9 in Figure 4). The gain of these two stages was chosen so that the last stage could be used by itself if a higher level source of audio is available. By opening the trace from pin 8 to C2, an external signal of about 1 volt or better can be injected into the positive terminal of C2. If you experience low frequency rolloff in your transmitter with this amplifier, you might try increasing the value of C11, the DC blocking capacitor in the external low-pass filter (Figure 4.)

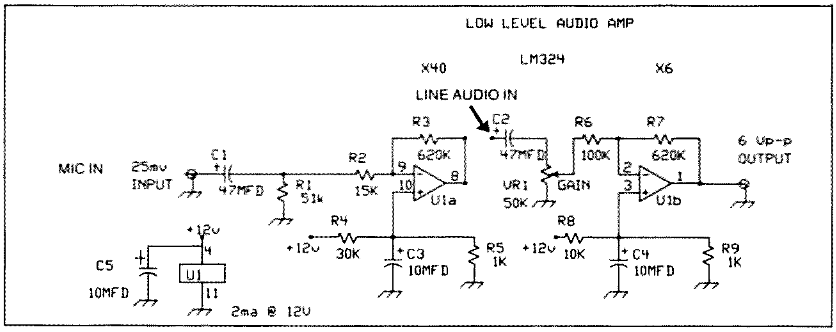


Figure 1. Audio amplifier circuit for microphone or line audio input.

The Transmitter Circuit

Transistor Q1 forms the 12 MHz oscillator and crystal Y1 is set on frequency by trim cap C1 (Figure 4). Zener diode D1 regulates the

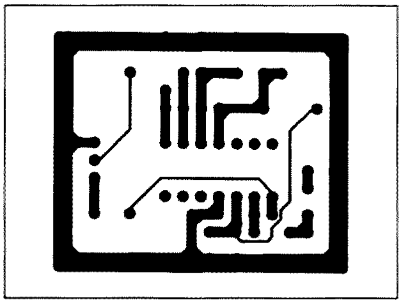


Figure 2. Audio amplifier foil pattern.

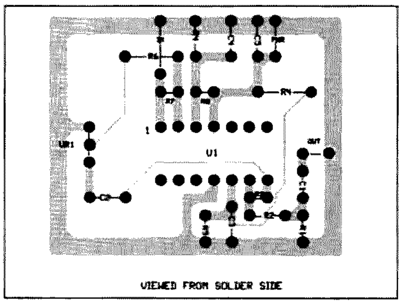


Figure 3. Audio amplifier parts placement.

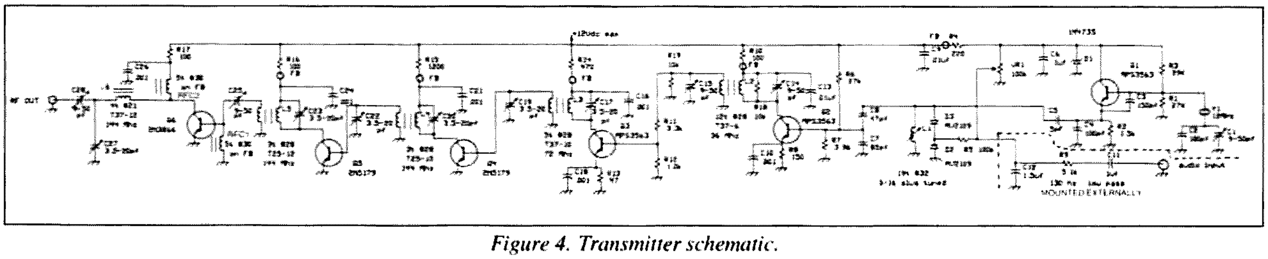


Figure 4. Transmitter schematic.

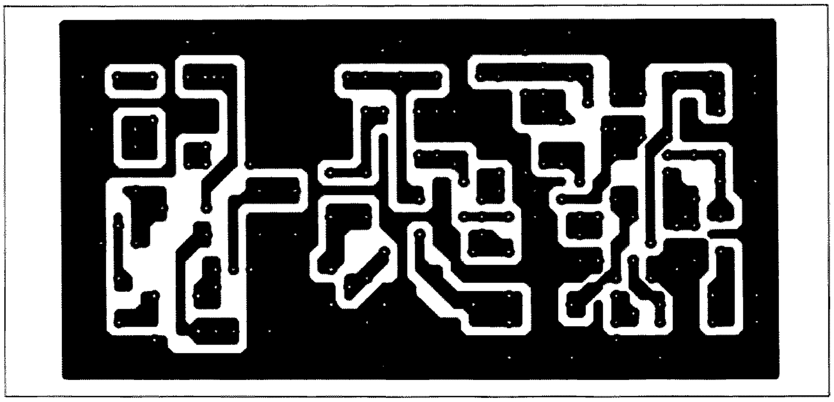


Figure 5. Transmitter foil pattern.

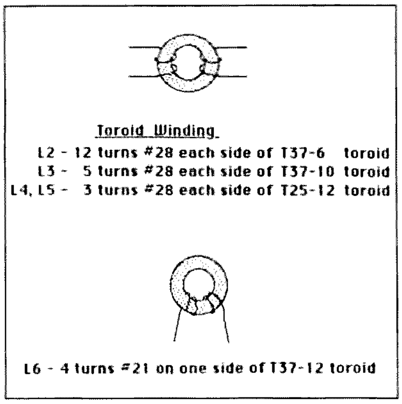


Figure 7. Toroid winding details.

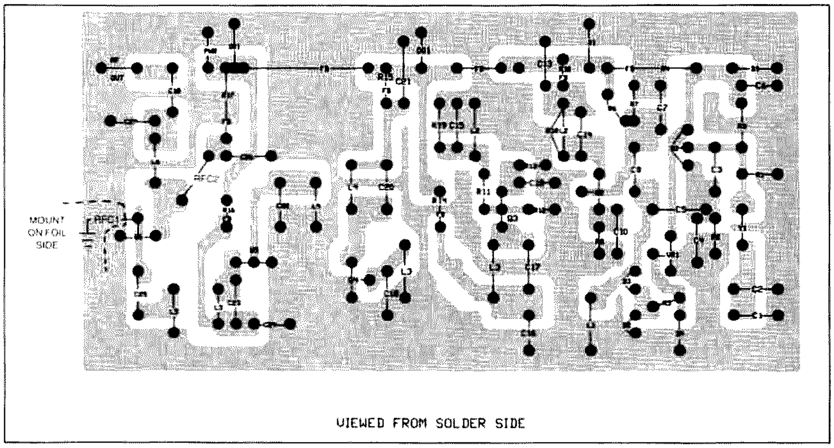


Figure 6. Transmitter parts placement.

power supply for the oscillator to 6.2 VDC for frequency stability. C5 couples the output of the oscillator to the phase modulator composed of L1 and varactor diodes D2 and D3. Pot VR1 sets the DC operating point for the diodes and is summed with the audio input to provide the modulation signal for the varicaps. Since phase modulators are sensitive to both modulation amplitude and frequency, audio is fed into the transmitter through a DC blocking capacitor C11 and an externally mounted low-pass filter composed of C12 and R9. Components C11, C12 and R9 are connected externally between the audio amplifier (or 6 Vp-p audio source) and the transmitter due to the fairly large size of C12. This filter provides the 6 dB per octave rolloff needed to maintain an equal deviation versus frequency response. About 6 Vp-p of audio is required to give 5 kHz of deviation.

The modulated 12 MHz signal is applied to Q2 where it is tripled to 36 MHz. Tank L2 is composed of 12 turns of wire on both primary and secondary and has its Q dampened by 10k ohm resistors on each.

The trim caps on this tank (C14 and C15) tune very sharply and must be adjusted with care. Q2 produces excessive 36 MHz energy so a voltage divider, composed of R11 and R12, drops the 36 MHz level applied to the base of Q3, the first class-C multiplier.

Tank L3 resonates at 72 MHz and is composed of 5 turns of #28 on each winding. Q4 is the first 2N5179 multiplier. The MPS3563 transistors don't perform well above 100 MHz so they are used only for the low frequency multipliers. Q4's tank resonates at 144 MHz and is composed of 3 turns each of #28 wire. There is an output of about 5 mW here but it lacks spectral purity.

Q5 is a low power amp that adds greatly to the purity of the final output. Its tank is also composed of 3 turns of #28 on each winding. About 20 mW of output is available here. Q6 is the final and is limited to just over 200 mW output by resistor R17. I do not recommend attempting to get higher power output by changing this resistor because you're bound to get instability.

Trim caps C28 and C27 match the output to a 50 ohm load and tune somewhat broadly. Two RF chokes composed of 5 turns of #30 wire on a small ferrite bead are used as a DC collector supply and a DC path to ground for the base of Q6. Other ferrite beads are used throughout the circuit for supply isolation.

Tune-Up

You need some basic test equipment to get any home-brew transmitter up and running. I would recommend a grid dip meter and a frequency counter as a bare minimum. Start by installing a crystal of your choice and a low-power 50 ohm dummy load at the output. Apply +12 volts and check for oscillation at Q1. This can be done by connecting a counter across L1.

Transmitter Parts List

C1,C14,C15,C28, C17,C19,C20,C25	9–50 pF trim cap
C22,C23,C27	3.5–20 pF trim cap
C3	150 pF disk cap
C4	100 pF disk cap
C5	5 pF disk cap
C6,C11	0.1 MFD monolithic cap
C12	1.5 MFD cap
C9,C13	0.01 MFD disk cap
C8	47 pF disk cap
C7	82 pF disk cap
C10,C16,C18, C21,C24,C26	0.001 µF disk cap
Q1,Q2,Q3	MPS3563
Q4,Q5	2N5179
Q6	2N3866
D1	1N4735 zener
D2,D3	MV2109 varicap
R1,R6	27k ¼ watt
R2	1.5k ¼ watt
R3	39k ¼ watt
R4	220Ω ¼ watt
R5	100k ¼ watt
R7	3.9k ¼ watt
R8	150Ω ¼ watt
R9	5.1k ¼ watt
R10,R16,R17	100Ω ¼ watt
R11	3.3k ¼ watt
R12	1.0k ¼ watt
R13	47Ω ¼ watt
R14	470Ω ¼ watt
R15	1.2k ¼ watt
R18,R19	10k ¼ watt
VR1	100k trimpot
L1	19T #32 on 3/16" slug-tuned form
L2	12T each winding of #28 on T37-6
L3	5T each winding of #28 on T37-10
L4,L5	3T each winding of #28 on T25-12
L6	4T of #21 on T37-12 core
RFC1,RFC2	5T of #30 wound on Ferrite Bead
FB	6 Ferrite Beads
Y1	Drake TR-22 xmit crystal

Audio Amplifier Parts List

U1	LM324 op-amp
C1,C2	0.47 µF/35V Elect.
C3,C4,C5	10 µF/35V Elect.
VR1	50k trimpot
R1	51k ¼ watt
R2	15k ¼ watt
R3,R7	620k ¼ watt
R4	30k ¼ watt
R5,R9	1k ¼ watt
R6	100k ¼ watt
R8	10k ¼ watt

Blank PC Boards are available from FAR Circuits, 18N640 Field Court, Dundee, IL 60118. Toroid cores and ferrite beads are available from Radiokit, P.O. Box 973-C, Pelham NH 03076. Phone: (603) 635–2235. Crystal Y1 can be obtained from KW Crystals, P.O Box 508, Prague OK 74864. Phone: (405) 567–2285 or JAN Crystals, P.O. Box 6017, Fort Myers FL 33906-6017. Phone: (813) 936–1404. All other components can be obtained from Circuit Specialists, P.O. Box 3047, Scottsdale, AZ 85271-3047. Phone: (800) 528–1417.

An alternative for the slug-tuned coil L1 is J.W. Miller part # 23A336RPC (2.40-4.10 µH) also available from Circuit Specialists.

Once oscillation is confirmed, loosely couple a grid dipper adjusted to 36 MHz to L2. Adjust L1 with VR1 in center position for a maximum reading on the dipper being used as a tuned RF voltmeter. Adjust C14 for maximum reading. About 1.1 VDC should be present at the emitter of Q2. Set the dipper for 72 MHz and couple it to L3. Adjust C15 and C17 for maximum indication on the dip meter. About 0.05 VDC should be at the emitter of Q3. Move the dipper to L4 and adjust C19 and C20 for maximum energy at 144 MHz. Move the dipper to L5 and adjust C22 and C23 for maximum signal at 144 MHz. You should be able to see some output at the 50 ohm load by now. Adjust C25, C27 and C28 for maximum output. Go back and retouch C14 through C28 for maximum. There should be a minimum of 100 mW output. Apply 6 Vp-p of 1000 Hz audio to the input of the low-pass filter.

Use a 2 meter rig as a monitor and adjust L1 to VR1 for the best-sounding audio. If possible, use an oscilloscope to monitor the shape of the received sine wave and adjust L1 and VR1 for best reproduction. These two adjustments interact quite a bit so jockey back and forth to obtain the best possible signal. Also, set the transmitter on frequency by adjusting C1.

If you monitor the unmodulated transmitter on a nearby receiver you can detect spurious outputs from a maladjusted transmitter. It is always a good idea to have a 2 meter rig on when making these adjustments. Any bizarre chirps or fluctuations in the received signal are a sure indication that a stage is in oscillation and needs to be rechecked. If at all possible, have your transmitter checked on a spectrum analyzer to be absolutely sure that no unwanted spurs are being emitted. Most of the units that I have built have no detectable spurs 50 dB down from the main carrier. Your particular transmitter may require additional filtering to meet FCC specs. The average weight for these transmitters is about 1.5 oz. with 170 mW of output at 12 VDC. The current consumption is about 100 mA.

Good tinkering! 73

Number 11 on your Feedback card

UPDATES

Two Meter Portable Quad —Correction

Charles W. Pearce, Ph.D., K3YWY, author of the above article in the June 1990 issue, has sent us a correction.

Refer to Table 2 on page 24. The spacers listed as 3.5" should be 4.5". Thank you, K3YWY, for the update. 73

73 Review

by Hap Griffin WA4UMU and Gerald Cromer K4NHN

The AEA FSTV-430A

A new ATV transceiver.

Advanced Electronic Applications, Inc.
2006-196th St. SW/P.O. Box 2160
Lynnwood WA 98036
(206) 775-7373
Price Class: $440

Fast-scan television (FSTV) has always been one of amateur radio's lesser-known modes. It is usually thought of as being one of those "esoteric" areas best left to the tinkerers and experimenters. Recently, though, the proliferation of VCRs and camcorders has made many hams think about what fun it would be to transmit live color video and sound, as well as home movies, to others. The full-page color ads from AEA, seen for the last year in all the major ham publications, make the idea seem even more attractive. It is no wonder that amateur television (ATV) activity has grown tremendously. The standing-room-only attendance at the Dayton ATV conferences this year is clear testimony to the new interest in this fascinating mode.

Some History

The ATV market has been dominated for the last two decades by two or three relatively small vendors. Occasionally we would see hints of interest from a large manufacturer (such as ICOM's ATV adapter for their IC-1271 33cm rig), but no firm commitments.

Last year, things changed. AEA, having earned a well-deserved reputation for being an innovator in the digital areas of the amateur radio marketplace, saw the potential for amateur television. They had been testing the water for some time by asking questions concerning VCR and TV camera ownership on their equipment warranty cards. Apparently the time was right to make a move into this nearly untapped communication mode. The first rumors that a major equipment manufacturer was about to come out with a radical new rig were heard at the 1988 Dayton ATV workshop. In early 1989 rumor became reality with the introduction of the AEA FSTV-430 transceiver.

This new rig was similar in size, power, and operation to the other two ATV transceivers on the market. What set it apart from (and, in our opinion, above) the crowd was its unique "vestigial sideband" output.

In VSB operation the wideband, amplitude-modulated video signal is filtered to drastically reduce the power in the lower sideband. The filtering is tailored to not remove the entire sideband (as in SSB) but to leave a "vestigial" part of it just below the carrier frequency. The reasons for doing this are complicated, but suffice it to say that VSB is the way it is done in broadcast television. The other two manufacturers simply amplitude modulate the video signal, mixed together with a 4.5 MHz FM sound subcarrier, and send it to the antenna with both sidebands intact and at close to the same amplitude.

Being in the broadcast industry and working with commercial television transmitters on a daily basis, Gerald and I have always tried to "do it right" when it came to designing and building home-brew ATV gear. Designing a transmitter for vestigial sideband operation is more demanding, complicated, and expen-

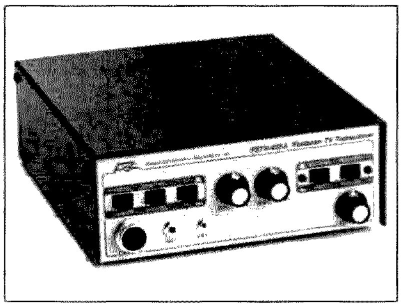


Photo A. Front view of the AEA FSTV-430A.

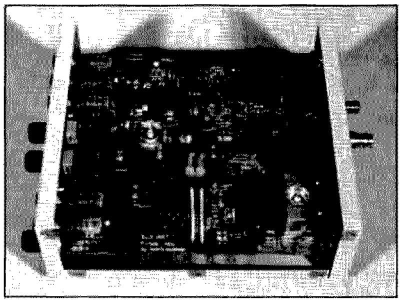


Photo B. Top view of the interior. The circuitry appears simpler than it really is.

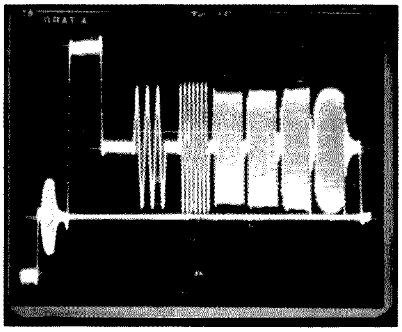


Photo C. Demodulated multiburst test signal. Frequency response is excellent.

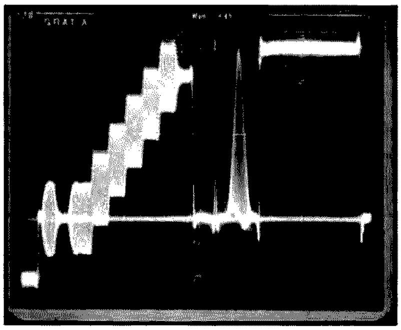


Photo D. Demodulated composite test signal.

Table 1. Measured Video Parameters

Differential Gain	4%
Differential Phase	7°
2T Pulse K-Factor	2.7% Kf
Pulse/Bar Ratio	104%
Luminance/ Chrominance Gain	127%
Luminance/ Chrominance Delay	175 Nanoseconds

sive than simply doing it the totally AM way, but you are rewarded with reports of outstandingly clear audio and "clean" tuning signals, as well as the knowledge that your transmission is as close as possible to true broadcast standards. Finally, here is a commercially available rig that comes darn close to those ideals.

The AEA FSTV-430A

The current offering from AEA is the new "A" model of the FSTV-430, introduced early this year. It looks and operates identically to the previous version (reviewed in the July 1989 issue of *73* magazine). However, there are several internal changes that make a good rig even better.

The construction is typically AEA: a two-piece, all-metal case with a tan and gray color scheme. Graphics and labels are silk-screened in black and red. The front panel has separate input jacks for microphone and PTT as well as a large 10-pin standard video camera input jack. Push-button switches are provided for power, transmit/receive, selection of two crystal-controlled transmit/receive frequencies, DC power to the 10-pin camera jack, and selection of the video source (front panel camera jack or rear panel RCA jack). Also present are controls for video and audio gain, as well as receiver variable tuning. The rear panel holds a DC power input jack, RCA jacks for auxiliary video and audio inputs, an "F" connector for channel 3 or 4 output to a TV set, and a BNC antenna jack.

The interior construction is very impressive. One large double-sided PC board occupies the entire case. Its neat layout belies the complexity of the circuitry—much of It is surface-mount and stripline technology on the underside of the board. Nice touches abound: clearly silk-screened component labels, silver-mica capacitors in the oscillator circuits, high-Q chip capacitors in the UHF circuits, tantalum capacitors in the video section, socketed crystals, gold-plated push-on RF connectors, a fully shielded BNC connector for output, Aromat T-R relay, machined aluminum block heat sink, etc., etc., etc. It is like a breath of fresh air to finally see commercial quality design come to amateur television.

Details

Referring to the block diagram in Figure 1, the selected video source is routed through the front panel video gain control and into an "expander amp." This stage has a "linearity" pot that is set at the factory to precompensate for any nonlinearity in the stages to follow. Audio input is routed through a variable gain, low noise op-amp circuit.

The heart of the rig has to be the LM-2889 video/audio modulator chip. It handles not only the video IF and audio subcarrier oscillator functions, but the AM and FM modulation of them as well. Video is clamped at the sync pulses by internal circuitry, and depth of modulation is set by an on-board pot. Output from the chip on TV channel 3 or 4 (selectable by a jumper) is routed through an SAW (Surface Acoustic Wave) filter that provides the vestigial sideband filtering.

An ingenious heterodyne scheme is used to upconvert this IF signal to the final operating frequency while, in the receive mode, to downconvert the 70cm receive signal back to this same IF frequency. With this system, your TV set does double duty—it's both a display for the receiver and a monitor for your transmitted signal. *[Ed. note: With this scheme you actually monitor the CH-3 or 4 modulator output before it's upconverted to 70 cm.]* The transceiver is supplied with one or two crystals installed for the more popular ATV frequencies: 421.25, 426.25, 434.0, or 439.25 MHz. Our test rig came set up for 434.0 and 439.25 MHz.

When operating simplex, the receive frequency is automatically the same as your transmit frequency. However, for operating split through a repeater or when just tuning the band for activity, a variable receiver tuning control is provided to give full-band coverage. The rig comes with the IF set to TV channel 3. If you wish to use channel 4, a crystal and jumper change are all that's required.

The receive preamp uses a surface mounted dual-gate GaAsFET (3SK164). Stripline filters are used in both the input and output circuits. The noise figure is advertised at less than 1.5 dB.

The frequency conversion chain is a fine

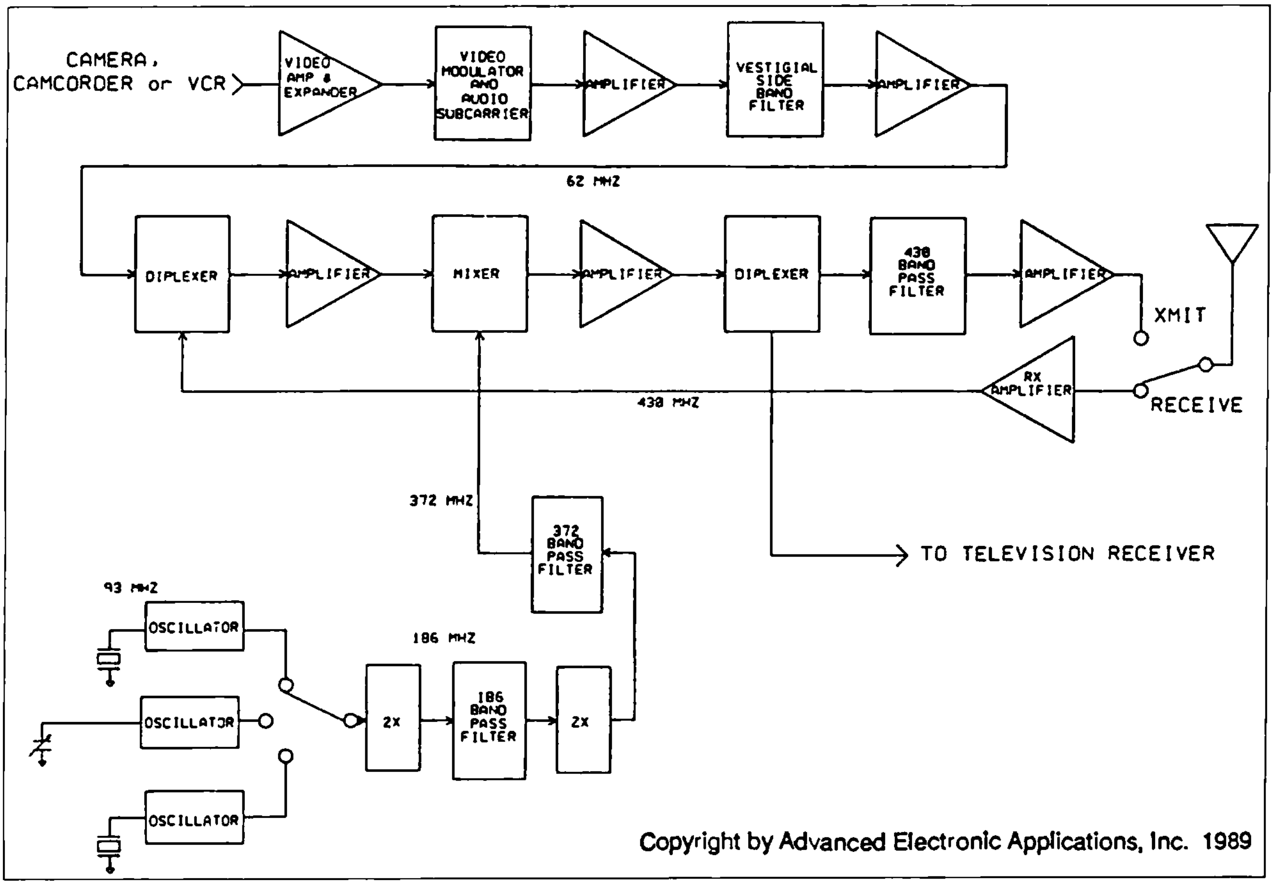


Figure 1. FSTV-430A block diagram.

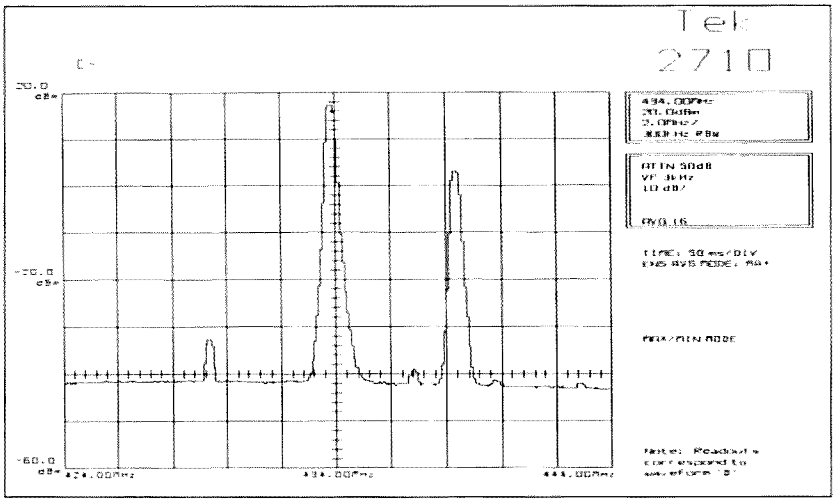


Figure 2. Unmodulated transmitter output. The video carrier is in the center with the aural subcarrier 4.5 MHz higher in frequency and 14.8 dB lower in amplitude. Actual levels are 10 dB higher than indicated due to an attenuator pad used to protect the spectrum analyzer.

example of AEA's up-to-date design philosophy. It uses a pair of diplexer circuits, a doubly-balanced mixer, stripline filters, and a total of six MMICs (Monolithic Microwave Integrated Circuits). The driver and the final linear amplifier stages show strict attention to conservative ratings and linearity, extremely necessary when dealing with vestigial sideband operation. Even though the rig puts out only one watt, the driver is a 3-watt MRF630 and the final is an RF1030, rated for 10 watts! Both stages have regulated bias supplies.

Receiver Performance

Although we have no way to accurately measure the noise figure, receiver performance is identical in A-B comparisons to a P.C. Electronics GaAsFET downconverter that has been in use for several years. Conversion gain was measured at 28 dB at 434 MHz. Frequency accuracy in the crystal mode was good: An input signal of 434.000 MHz produced an IF output on 61.280 MHz. Current draw in the receive mode measured 415 mA in the crystal mode and 450 mA in the variable tuning mode.

Transmitter Performance

With a properly modulated video signal, peak RF output power was measured at +29.2 dBm (0.832 watts). The aural subcarrier measured 14.8 dB below the visual carrier.

Current consumption was 1.30 amps. After 10 minutes of continuous transmitting, peak power dropped slightly to +28.9 dBm (0.776 watts) and current demand rose to 1.33 amps.

Reducing the power supply voltage from 13.8 to 12 volts (simulating battery operation) dropped the peak power output only 0.2 dB, from 0.832 watts to 0.795 watts. Current draw dropped to 1.10 amps. These current levels may seem high for a 1-watt rig, but remember that all amplifier stages are operating class A for best linear operation.

Figure 2 shows the unmodulated transmitter output. The visual carrier is at the center with the aural subcarrier 4.5 MHz higher in frequency. The residual lower sideband aural subcarrier can be seen 4.5 MHz below the visual carrier. The action of the VSB filter is obvious: The lower subcarrier is reduced approximately 36 dB below the level of its upper sideband counterpart. This equates to −52 dBc, which is 10 dB better than the factory spec. (dBc = dB below video carrier). You can see a low amplitude spur about three MHz above the visual carrier but, because it is nearly 60 dB below carrier, its effect is not noticeable. This spur is not present when operating at frequencies other than 434 MHz. The transmitter's second harmonic was relatively

strong at 25.4 dB below carrier. Several other minor out-of-band spurs were noted, but these were all more than 50 dB down.

At startup, the visual frequency was 434.04 MHz, drifting slightly to 433.96 MHz after 10 minutes of operation. The relative sound subcarrier frequency changed from 4.48 MHz to 4.56 MHz. While seemingly a lot, the drift was not noticeable in actual on-the-air operation. Frequency stability on 439.25 was similar.

Figure 3 shows a video sweep of the transmitter. Vestigial sideband operation is clearly present; the upper sideband response (the area between the visual and aural carriers) is flat to within 3 dB, and the lower sideband more than 1.25 MHz below the visual carrier is greatly reduced.

Because of the design of the SAW filter used, video response extends up to, and even past, the 4.5 MHz sound subcarrier. This wide high-frequency response means that detail and color saturation will be good, but video signals with lots of high frequency content (such as computer generated graphics) may cause sync buzz in the sound. The solution would be to build a simple four MHz low-pass filter for the computer output.

Photo C shows actual demodulated video from a multiburst test signal generator. Frequency response is, in a word, excellent. Photo D shows a composite test signal used to measure several video parameters (see Table 1). These two photographs are not bad for any TV transmitter, especially a piece of amateur gear. We have seen many commercial stations with signals much worse than these!

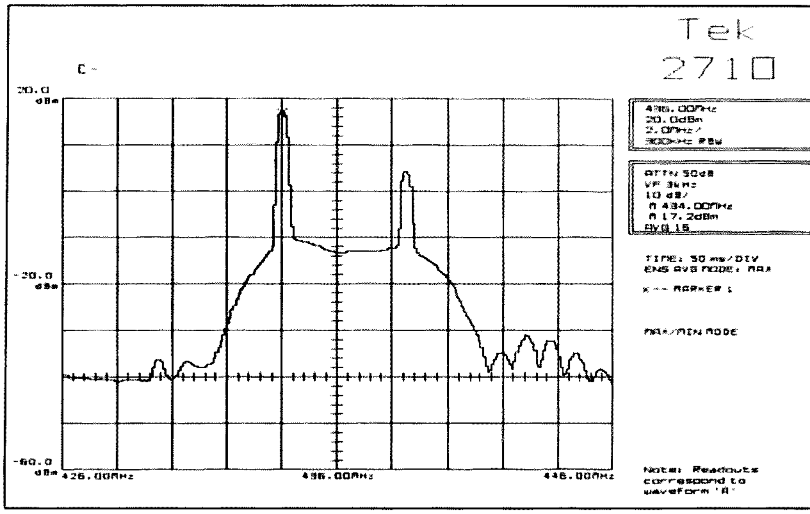


Figure 3. Video frequency response of the FSTV-430A. Vestigial sideband operation is clearly apparent.

Curiously, as the photos show, sync level is only 35 IRE units. This small amount of compression was not in the test gear, so we can only assume it was being reduced from the normal 40 units in the transmitter. This is surprising because the linearity of the rig was excellent (only 4% differential gain). Adjustment of the depth of modulation and linearity pots in the modulator did not seem to help.

Comments

The on-the-air performance of this rig is excellent, adding testimony to the fine results of the technical measurements.

The overall design and appearance of the transceiver are very good, although the front panel silk-screen on our test unit was slightly out of alignment. We would have preferred a standard mike jack instead of the separate miniature phone-type jacks for mike audio and PTT. Although some would prefer a type-N output connector as opposed to the BNC connector supplied, we feel that most users will operate this rig with an external amplifier and that the BNC is entirely appropriate.

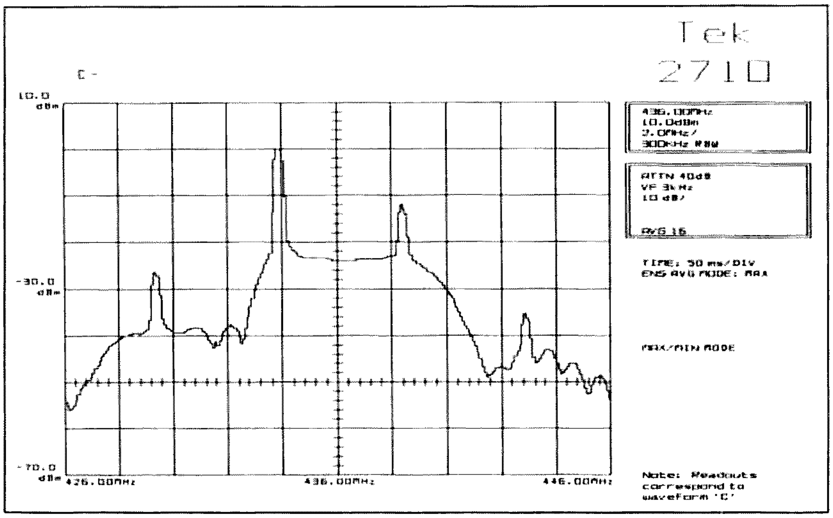


Figure 4. Output sweep of Mirage D24 amplifier being driven by the FSTV-430A. Vestigial sideband response is not as good as in Figure 3 but it is still entirely respectable.

Power output on our test unit was a bit below the 1 watt rating but there was still plenty to work the local gang with good antennas. We had to reduce the power even further to prevent driving an external Mirage D24 amplifier into nonlinearity.

The instruction manual is well written and complete. It provides a block diagram as well as a full schematic with a parts placement diagram. There is no alignment information, but most ATVers lack the test equipment to properly adjust the extensive filtering in a VSB transmitter anyway.

Customer service is excellent. Mike Lamb and Al Chandler at AEA really believe in their creation and are very helpful answering questions and listening to users' comments.

As a matter of illustration, we reported a problem with sync distortion early in this review. After several conversations, Al Chandler concluded that there was indeed a small design flaw in the new 430A model. This problem was fixed by the addition of a 47 ohm resistor in parallel to R40 in the modulator circuit. The sync distortion was cured and all further production units will include this change.

We would rather see a modulator circuit where the video is clamped to blanking, the sync regenerated and re-inserted through a sync level pot. This would provide constant sync level with various video sources as well as the ability to fade to black with the front panel video gain pot without lossing sync-lock.

There have been some negative comments concerning the unit's relatively high price tag. After looking at the quality and cost of the parts used, as well as the obvious amount of research and design time, it is easy to conclude that the profit margin on this rig is probably a lot less than the competition's offerings. It is simply not cheap to produce a quality, vestigial sideband TV transmitter.

If you want an ATV signal second to none and as close as possible to "real" TV, you could not go wrong with the AEA FSTV-430A. While not perfect, as far as we are concerned it is the new standard of ATV performance.

Using the FSTV-430A with External Power Amplifiers

The one watt power output from the FSTV-430A (as well as the other low power rigs on the market) is plenty to work the local gang on simplex or any nearby ATV repeaters. Most hams, though, will sooner or later want to hook up an external power amp to get some extra range. As with any amplitude-modulated mode, linearity is critical, especially with vestigial sideband ATV. You can't just hook up an amp and adjust for maximum power on the wattmeter.

Most amplifiers available to amateurs are not truly linear, particularly near their power rating. To achieve any resemblance of linearity we must be prepared to de-rate that expensive new "50 watt" amplifier to around 20 watts or so average power, as seen on a wattmeter. Of course, video being the complex waveform that it is, peak power is considerably higher. This is even more important when we are trying to run vestigial sideband. Nonlinearity produces distortion that can "regenerate" that lower sideband we have been so careful to attenuate. As a matter of fact, the competition's argument against VSB on amateur television is that even though you can generate it, you can't amplify it with amateur grade equipment. We agree with that argument to some degree, but believe that the merits of VSB still make it a very worthwhile goal.

Figure 3 shows the results of running the FSTV-430A through a Mirage D24 50 watt amplifier modified for ATV by P.C. Electronics. The drive from the transceiver has been reduced approximately 3 dB to keep from overdriving the amp.

Average power output as read on a Bird meter is 18 watts, with just-noticeable sync compression. Comparing this sweep with that shown in Figure 2 we see that the nonlinearity has caused the lower sideband aural subcarrier to go from being 36 dB down from its upper sideband counterpart to being only 14 dB down (−52dBc to −30 dBc). However, lower sideband video response is still approximately 16 dB below the upper sideband response. This is not too shabby, as the FCC defines vestigial sideband for broadcast television as being only 20 dB down.

Figure 4 shows the sweep obtained by using a home-brew 30 watt amplifier with a Mitsubishi 57745 "brick" sold by R.F. Parts, Inc. The drive from the FSTV-430A had to be reduced approximately 6 dB, as the amplifier has very low input power requirements. The lower sound subcarrier is down from the upper by 15 dB and the lower video response is down 15 dB (−31 dBc) or better. Average power output was 20 watts with NO SYNC COMPRESSION. Not bad for an $89 amplifier chip!

AEA has a 50 watt tower-mounted amplifier in the works that should be available by the time you read this. It is designed from the ground up for extremely conservative and linear operation to better preserve the vestigial response characteristics of the FSTV-430A. Included will be an integral GaAsFET preamp as well as a "through-the-coax" power feed system. It should prove very interesting.

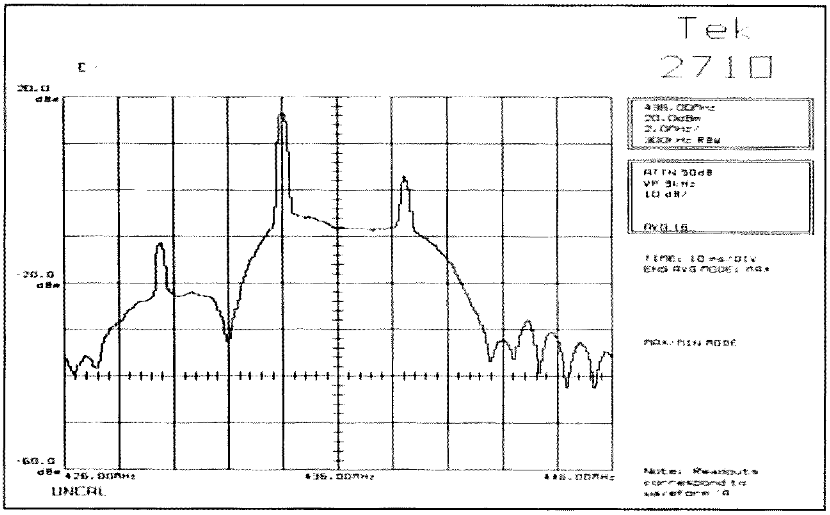


Figure 5. Output sweep of home-brew amplifier using a Mitsubishi 57745. Not bad for an $89 chip!

High Altitude Ballooning

New Heights for ATV!

by Bill Brown WB8ELK

August 15, 1987. . . The first attempt to send ATV to new heights via a weather balloon! Winds gusting to over 20 knots cause the fragile package to crash repeatedly into the ground (Photo A). The third attempt just barely clears the nearby cornfield, and the rather beat-up payload rises upwards at nearly 1000 feet/minute to achieve record altitudes. Since that flight, 13 flights have occurred in various locations all over the US.

Why send up a balloon? Let's take a look at the big advantages of increasing your antenna height. Those of you active on the VHF and UHF bands know that getting your antenna up as high as possible makes all the difference. Just getting your antenna above the treetops can really improve your signal tremendously. Although low-noise preamps, high power amplifiers, large antenna arrays and band enhancements can extend your range substantially, the average VHF or UHF station can expect line-of-sight coverage. This is particularly true of a wide bandwidth ATV signal. Depending on terrain, the average ATV station's range with a 50-foot tower is between 30-50 miles for a watchable picture.

What effect will increasing your antenna height have on coverage? Line-of-sight range can be determined with the formula: Radio line-of-sight = $1.41 \times \sqrt{H}$ where H = height in feet; and optical line-of-sight = $1.22 \times \sqrt{H}$. Figure 1 shows the dramatic increase in range that results from increased antenna height.

Just by taking your rig up in a small airplane you can expect 122 mile or more contacts at 10,000 feet. A weather balloon will allow you to increase your antenna height to over 100,000 feet! Using a 1 watt ATV transmitter to an omni-directional antenna, you can send a watchable picture up to 400 miles away. Experimental results indicate that 2 meter reception seems to follow the radio line-of-sight formula, while ATV reception follows the optical line-of-sight formula (Figure 2).

Although the payload on the first flight stopped transmitting at 60,000 feet due to battery failure, stations 300 miles away were able to watch the ATV signal, and the 50 milliwatt, 2 meter signal was heard out to a distance of 400 miles. Subsequent flights have operated for the complete duration and confirmed the theoretical range limits. The highest altitude achieved so far was over 133,000 feet from a balloon launched from the Neil Armstrong Air & Space Museum (Wapakoneta, Ohio) last summer. Signals from that flight were received over a 10-state area from Pennsylvania to Iowa.

Line of Sight Range

Optical = $122 \times \sqrt{H}$

Radio = $1.41 \times \sqrt{H}$

Antenna Height*	2 Meter Range	ATV Range
50	9 miles	8 miles
10,000	141 miles	122 miles
50,000*	315 miles	273 miles
100,000*	445 miles	388 miles

*Height in feet

Figure 1. Line-of-sight range vs. altitude.

Photo A. First flight of the ATV package.

Photo B. Inflating the balloon.

Launch Your Own Balloon

A balloon flight is a great way to demonstrate the capabilities of amateur radio to a wide audience. Just inflate a 5-foot weather balloon in a park or public area and watch how quickly the crowd forms (Photo B)! Launch preparations and flight coverage can spark the interest of your whole radio club. Payload design and assembly, HF net launch coverage, receive station design and, of course, tracking down the payload, offer something for everyone.

Radiosonde Flights

Not wishing to reinvent the wheel, I decided to see how the weather bureau obtained their upper air winds aloft forecasts. It turns out that 5-foot weather balloons are launched twice daily at 0000 and 1200 UTC from over 73 sites across the US (Figure 3). After visiting two sites (Vandalia, Ohio, and San Diego, California) I learned firsthand the tricks of the balloon-launching trade. The upper air sounding balloons carry a payload known as a radiosonde (or rawinsonde—Radio Wind Sonde). A 5-foot balloon filled with helium (or hydrogen at some launch sites) carries the 1.5-pound radiosonde up to around 100,000 feet or so.

The radiosonde transmits a wideband telemetry signal on or about 1680 MHz which is received by an 8-foot tracking dish. The dish can measure azimuth and elevation to an accuracy of 0.01 degree. A tone sequence is sent out from the sonde indicating pressure (altitude), temperature and humidity. The altitude telemetry and tracking antenna position are used to calculate the wind speed at various flight levels. This data is sent to the National Weather Service for use in weather and winds aloft forecasting.

If you own an ICOM R-7000 or other rig which can tune to 1680 MHz (± a few MHz) in wideband FM mode, you can listen in on the sondes. Using a 2-foot dish I've been able to pinpoint the location of several flights from Vandenberg AFB in California and actually see the balloon burst at 100,000 feet. Through a pair of binoculars it was quite an impressive explosion!

Reiner Junge DC3OQ/W5 and Mike Olbrisch KD9KC have even been chasing down the sondes launched from the El Paso, Texas,

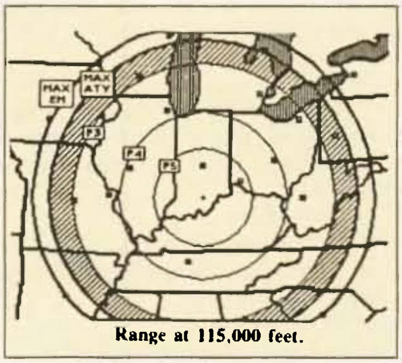


Figure 2. Line-of-sight coverage map for 115,000 feet.

site. They use an ICOM R-7000 and a homebrew, 11-element beam to track down the radiosonde as it parachutes back to earth. They've recovered over 40 of them over the past few years and they eventually want to actually catch one before it hits the ground. On their last chase the sonde landed just 50 feet in front of their jeep!

Photo C. Live camera payload.

Photo D. Jeff Brown KA8WLV readies the camera payload for liftoff.

The Payload

FAA regulations set a payload limit of 4 pounds on a free-flight balloon. Although 6 pounds can be used if certain density requirements are met, it's best not to get caught up in any paperwork or permit requests. Always alert the FAA whenever you plan a flight. Give them a week or two to issue a NOTAM (Notice to Airmen). You should contact them the night before the flight, six hours before liftoff, and get clearance for takeoff 30 minutes before final countdown. Above 60,000 feet is uncontrolled airspace, but they like to know when the payload is descending back down below this altitude. If you have a chase plane, they can handle this communication readily with the nearest control center.

It's quite a challenge to design a self-contained payload complete with battery pack that weighs under 4 pounds (Figure 4). Fortunately, the lithium cell has made extremely powerful and lightweight battery packs a reality. SAFT makes a D-Cell (the LX3457) that is a real powerhouse of energy. Five of these cells provides you with a 13.8 volt pack with a 7 Ah capacity weighing under 1 pound! You can also use 10 C-cells (SAFT LX2649) as long as you install blocking diodes in each chain. If your current drain is under 1 amp, you can power your package for upwards of 7 hours with this pack. WARNING: Be very careful when assembling lithium cell packs. Due to the high current capabilities, a lithium cell may explode if shorted out. The newer cells have a safety vent, but it pays to have a healthy respect when handling them. If you're wary of assembling your own battery pack, AVEX Portable Battery can put together a complete pack with a safety fuse for a reasonable fee.

Try to keep everything as light as possible. I use a small piece of double-sided circuit board and mount components on both sides. If shielding is required, use lightweight copper foil or double-sided PC board stock. Antennas can be made out of lightweight aluminum or brass rod with as few connectors as possible. I mount everything in a 1.5 inch thick styrofoam shell and seal it up with duct tape. Not only is the styrofoam lightweight, it also protects the electronics from the bone-

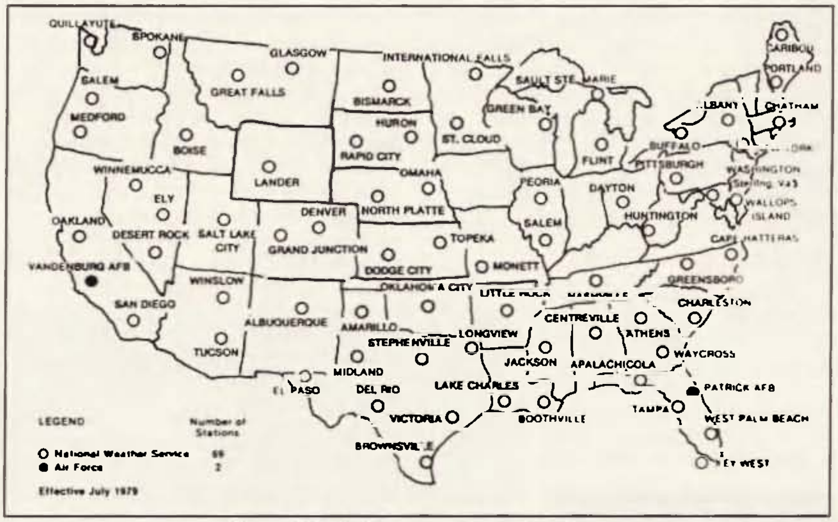


Figure 3. U.S. Radiosonde launching sites.

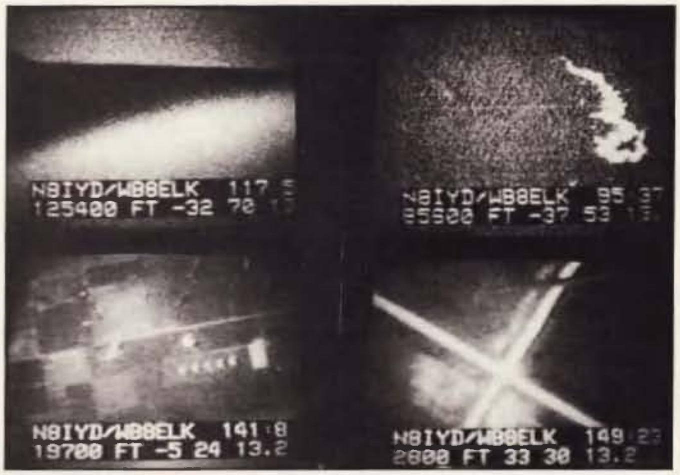


Photo E. Views from the live camera video downlink.

Photo F. Launch crew in position.

Photo G. One of the chase vehicles ready to track down the package. Photo by Phil KA9WGN.

Photo H. A jubilant chase team recovers the prize from the cornfield!

Photo K. Commemorative QSL for first balloon flight.

chilling cold temperatures at the higher altitudes. While it may be 100 degrees at ground level, temperatures plummet to 60 below at 50,000 feet. Once through the coldest part of the atmosphere (between 35,000-70,000 feet), it warms up to a "toasty" −23 degrees at 110,000 feet.

What to fly? Payloads have consisted of a 10-milliwatt 2-meter CW transmitter, packet digipeater (the world's highest and BUSIEST digi), digitized voice messages on 2 meters, linear transponders and many different ATV configurations. The most recent live TV camera flights used a flight computer to superimpose altitude, temperature and battery voltage directly over the camera's view of the Earth below (Photos C and D). *[Ed Note: See the article on rocket ATV in this issue].* Bob N8IYD even built a servo-mounted mirror to look at the Earth as well as at the horizon. At 100,000 feet, the view was very similar to what you'd expect from the shuttle (Photo E). The blackness of space and the curvature of the Earth could clearly be seen.

Giving Your Payload a Ride

The typical balloon flight system is shown in Figure 5. Most of the balloons flown so far have been manufactured by Kaysam Corp. of Paterson, New Jersey. Although I haven't tried them yet, high quality balloons made by Toetex are also available from both VIZ Corp. and Vaisala, Inc. (see the sidebar for a list of sources). These balloons are specifically designed for high altitude flights, and their burst altitudes can be accurately predicted. As the balloon rises in altitude, the atmospheric pressure decreases. At 100,000 feet the pressure is only 1% that of sea level. Even though the neoprene weather balloon may start out with a 5-foot diameter on the ground, it expands as it encounters lower atmospheric pressures. At 100,000 feet your balloon will be nearly 27 feet in diameter as it approaches a near vaccuum at the edge of space. At this point it bursts like a giant party balloon, allowing your payload to parachute back to Earth.

The three balloons used successfully in past flights are the Kaysam models 90G, 105G and 50P. The 90G will lift a 4-pound payload to around 90,000 feet, while the 105G can attain heights approaching 120,000 feet. For small payloads under 2 pounds, the 50P can take your payload up to about 60,000 feet at a fraction of the cost of the bigger balloons (and a substantial savings in helium!).

Inflating the Balloon

It takes about 120 cubic feet of helium to fill a 5-foot weather balloon (Kaysam 90G) to lift 6 pounds. I typically fill the balloon to have 50% more lift than payload (6 pounds lift for a 4-pound payload) to achieve a good takeoff and rise rate (about 1000 feet/minute). Although you can take off with as little as 2 ounces of positive lift, you run the risk of crashing the payload on takeoff and prolonging the flight. A quicker flight generally lands a little closer to home and avoids your having to chase it hundreds of miles across the country. It's a good idea to buy a tank of helium with twice the amount that you need, just in case of disaster. Always keep a spare balloon around for the same reason. You can use the excess helium to fill up party balloons with notes attached for the kids. Some of these party balloons have been found over 400 miles away. And, of course, you'll find plenty

Photo I. Debbie Flivor KA9JYI ready to launch the Microballoon.

Photo J. Massive 500-foot balloon prepares for liftoff from Balloon Facility. Photo courtesy of National Scientific Balloon Facility, Palestine, Texas.

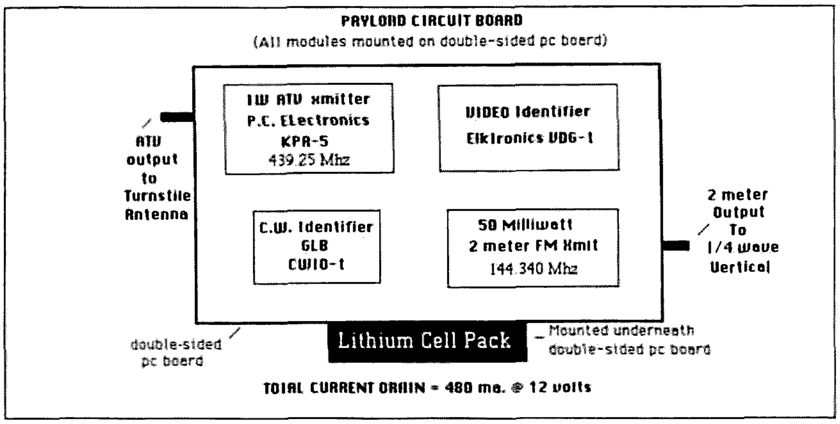
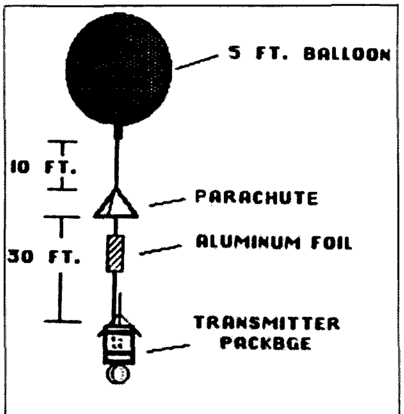


Figure 4. Payload block diagram (first flight).



Typical Balloon Package.

Figure 5. Balloon flight system.

of folks willing to use up your excess helium to imitate Mickey Mouse.

For the larger balloons, it's a good idea to find an enclosed barn or hangar for inflation. Any wind quickly turns the inflation process into a very harrowing experience. Make sure the building's door is large enough to remove the balloon. It only takes one sharp object to cause a very expensive POP!

The uninflated balloon can be laid out on a smooth table or surface. I use a large bedsheet to cover the table surface. Joe WB8MSJ designed a special filling apparatus to make inflation easy. See Figure 6 for construction details. The end of the filler hose is constructed out of 1.25" I.D. PVC pipe (this gives you a 1.5" O.D. filling nozzle) which allows the balloon nozzle to fit snugly over the filling tube. The balloon is held in place with

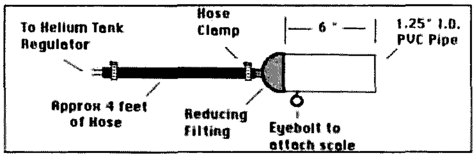


Figure 6. Helium filling apparatus.

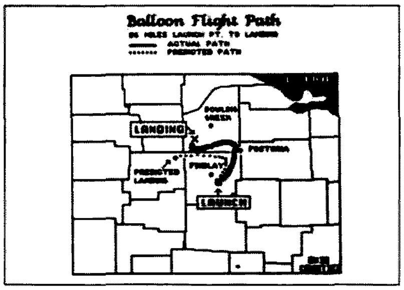


Figure 7. Predicted vs. actual flight path.

U.S. Balloon Launches Since 1987

WB8ELK 8/15/87—Findlay, Ohio. P.C. Electronics 1 watt ATV transmitter with Elktronics video ID. 50 mW, 2m FM with GLB CW ID. Maximum altitude of 60,000 feet. Found six weeks later in soybean field 26 miles away.

W9PRD 6/4/88—Greensburg, Indiana. Wyman Research 1.5 watt ATV transmitter and 400 mW Johnson 2m FM. 119,000 feet maximum altitude. Found in tree 86 miles southwest of launch site.

W9PRD 10/8/88—Greensburg, Indiana. Wyman Research 1.5 watt ATV transmitter and 400 mW Johnson 2m FM. 110,000 feet. Found in front yard of house near Rabbit Hatch, Kentucky, after travelling 55 miles.

KA8TEF/WB8ELK 10/23/88—Findlay, Ohio. Pac-Comm micro TNC and ICOM 2A HT. Packet digipeater. Packet connections made over an 8-state area. 85,000 feet altitude. Package lost on island in middle of Lake Erie.

WB8ELK 1/21/89—Hesperia, California. First flight of a live camera to 100,000 feet using ATV. 1 watt PC ATV transmitter. Sony HVM-302 B/W camera. 100 mW VHF Engineering, 2m FM. Seen in Phoenix, Arizona, over 350 miles away. Found by Tom W6ORG in his helicopter on the desert floor 22 miles northwest of launch.

N4HBO/WA4ADG 4/15/89—Knoxville, Tennessee. 10 milliwatt 2m CW transmitter launched with 60 party balloons from children's musuem. Beacon heard for 2½ hours as far away as 150 miles.

KV5G/WB5UXF 4/29/89—Pearland, Texas. 10 watt ATV system with live camera. Maximum altitude of 12,000 feet. Seen over 150 miles away in Austin, Texas. Farmer shot package thinking it was bomb. One of the bullets broke the camera's vidicon tube.

N8IYD/WB8ELK—7/23/89 Neil Armstrong Air & Space Museum, Wapakoneta, Ohio. Live TV Camera (Sony HVM-302) with on-screen telemetry from flight computer commemorating first moonwalk. 1 watt Kreepie-Peepie ATV transmitter (P.C. Electronics) and 50 mW, 2m FM with CW ID. Maximum altitude of 133,000 feet. 400-mile range on ATV and 2m.

WA4ADG/N4HBO—8/5/89 Oak Ridge, Tennessee. Special digitized voice message commemorating man's first moonwalk. Voice on 2 meter FM along with ASCII telemetry, CW telemetry from onboard flight computer on 10 meters. ELT test transmitter for Civil Air Patrol exercise. 90,000 feet altitude. Found in tree in suburb of Knoxville by the CAP, taking several hours to remove.

KA9SZX/KA9SZY/WB8ELK/N8IYD—10/7/89 Champaign, Illinois. Third flight of the live camera payload. Servo-operated mirror added to provide views of the horizon as well as the ground. Spectacular views of the curve of the earth and blackness of space above 100,000 feet. Maximum altitude of 125,000. Found in soybean field in Indiana after travelling 113 miles.

KA9JYI/KA9SZX/KA9SZY/WB8ELK (Photo I)—10/28/89 Champaign, Illinois. Micro-balloon flight using leftover helium from 10/7 flight. 10 milliwatt CW transmitter (See "Two Meter Tracking Transmitter," *73*, July, 1990) on 2 meters with temperature telemetry. Launched with small 3-foot sounding balloon to 60,000 feet. Found in field 86 miles away, near Remington, Indiana, by Eb WD9I.

KDØFW—2/10/90 Lawrence, Kansas. 3 watt ATV transmitter with VDG-1 video display. 50 mW, 2-meter transmitter with digitized voice message. Maximum altitude of 94,000 feet. A nearly snow-free color picture received over 390 miles away to the Colorado border. Found in tree 56 miles east of launch site near Peculiar, Missouri. Sawed down part of tree and shot at string with shotgun to bring it down.

WA4ADG—5/19/90 Knoxville, Tennessee. 10 meter in—2 meter out linear transponder. Altitude of 90,000 feet. Operating much like an OSCAR satellite, stations as far away as Ohio were able to work through the transponder. Lost in very rugged and mountainous terrain near the Appalachian Trail, 77 miles east of launch site.

a spring clamp or a hose clamp. The filler nozzle goes through a reducing adaptor to a regular automotive hose which connects to your helium tank regulator. If you have a party balloon regulator, remove its small rubber nozzle and replace it with your filling hose. ALWAYS USE A REGULATOR unless you want a jet-assisted balloon launch!!

An eyebolt can be mounted in the part of the filler nozzle away from the balloon (be sure to epoxy around the eyebolt to prevent leaks). This allows you to hook in a digital fishing scale or known weight. Taking into consideration the weight of your filling apparatus, you can easily measure the balloon lift until you reach the desired value.

After inflation, tie the balloon nozzle closed just above the filling tube. Use at least three good knots, then loosen the hose clamp and carefully slide the balloon off of the filling tube. I usually wrap the end of the balloon nozzle with a little furnace tape just to be sure. Run about 15–20 feet of line down to the top of your parachute and tie securely. The parachute should be at least 3 feet in diameter (4 or more feet is best) and should have a plastic ring below the chute to keep the shroud lines from tangling. Attach another line to the bottom of the shroud lines and run about thirty or more feet down to the payload.

Balloon and Battery Sources

AVEX Portable Battery
Attn: Mike Batley
P.O. Box 1026
Bensalem PA 19020
Phone: (800) 345-1295
—SAFT lithium battery packs

Kaysam Corp. of America
27 Kentucky Avenue
Paterson NJ 07503
Phone: (201) 790-3366
—Meteorological balloons

VIZ Manufacturing Co.
335 E. Price St.
Philadelphia PA 19144
Phone: (215) 844-2626
—Parachutes, radiosondes and Totex balloons

Vaisala, Inc.
Attn: Ken Goss
100 Commerce Way
Woburn MA 01801
Phone: (617) 933-4500
—Radiosondes and Totex balloons

A 6-foot strip of aluminum foil is taped to the line just below the parachute to aid in tracking by FAA radar. A suitable parachute is available from VIZ Corp.

Launch!

Apply power to your payload (I almost forgot this step on two separate launches!). Just as you remove the balloon from its shelter, Mother Nature will probably decide to give you a hard time. It's typical to have a dead calm condition for hours before the flight, then be hit with 20-knot wind gusts at launch. Just hang onto the balloon for dear life and try to keep it from hitting the ground. Have your ground crew hold the payload DIRECTLY downwind and let go of the balloon (Photo F). Release the payload when the balloon is overhead and hope you see it again!

HF Net

Now the fun begins. During the past flights we've used either 7.155 or 7.232 MHz for our launch information net. Even if you don't receive any signals from the balloon package, it's great fun just to listen in to one of these nets. The excitement builds as the words "The balloon is UP!" comes over the loudspeaker. It's quite a thrill to listen to the reception reports coming in from increasingly further distances as the balloon gains altitude. Some of our net controls definitely have my vote for NASA mission controller!

Tracking it Down

Keeping track of a fast moving balloon package has to be the "Ultimate Foxhunt." If you ever expect to see your payload again, try to organize a chase team with DF gear (Photos G and H). If there is a local foxhunting or T-hunting group, you should have no trouble getting volunteers for the chase crew. It's relatively easy to track the balloon when it's in the air. The tricky part comes when it finally lands. It could land anywhere—in a tree, a ravine, or draped across someone's front yard. Pick a 2 meter coordination frequency and have the chase vehicles provide periodic antenna headings to help track the balloon's position. This will narrow down the search area once the package lands.

A chase plane (or helicopter) is invaluable in pinpointing the final touchdown point. Even if no DF gear is on board the plane, the payload's position can be narrowed down close enough to enable the ground team to start hearing the beacons.

The Indianapolis Foxhunters are quite experienced at bringing back payloads alive. They have four successful recoveries to their credit. Hacking their way through dense woods, mosquito-ridden cornfields, and the hills of Kentucky, usually nets them their quarry. Paul W9DUU and Larry WB9YAJ are such avid balloon hunters they they will usually track any balloon launched within 500 miles of Indianapolis.

Another experienced group is the Southern California T-hunters. In my first live TV camera flight from the Mojave desert, they assembled a massive effort to keep track of the balloon's path. Aiding in the hunt were members of the Amateur Television Network (ATN). The ATV group supplied not only a chase plane, but a chase helicopter! The T-hunters were so accurate in their headings that the chase plane was able to see their wing in the downlinked video and catch a glimpse of the package whizzing past them. It only took a few minutes for Tom W6ORG to fly his helicopter right to the impact spot in the Mojave Desert.

It's always great to get your package back after a flight to the edge of space. It's also good for a few weeks of incredible stories on the local repeater!

Predicting the Landing Site

I've developed a BASIC tracking program for the IBM or compatible PCs that will predict where your package will land with a fair degree of accuracy (Figure 7). For best results you need to find a way to obtain the latest radiosonde wind soundings from a nearby site. This is not an easy task; however, your local weather bureau may be able to tap into this information. Using data from nearby radiosonde flights, I've been able to predict the landing point of our payloads within a couple of miles in several instances. The Wapakoneta flight prediction missed by only 0.9 of a mile.

Reasonable results can be obtained through use of the aviation winds aloft forecast. This data is only good up to 53,000 feet in selected areas, but it should provide you with information on the general area where your package will land. If you are a pilot, you can obtain this information via the DUATS direct dial-up modem service or from any Flight Service Station. Those of you on CompuServe can access this information as well; type GO AWX-1 to go to the aviation weather section. Select option 4 to obtain winds aloft for your

area. This wind data is compressed by the weather service and needs to be decoded. The first part of the data is wind direction (add a zero to the first two digits). This is followed by two digits representing wind speed. The last two digits indicate outside temperature. Example: 312349 translates to a wind direction of 310 degrees, wind speed of 23 knots and a temperature of −49 degrees C.

I will provide this tracking program on the *73 Magazine* phone line BBS, or you can send me a blank disk and return postage. The program name is BALLTRAK. Also look for the program called BALLIFT. BALLIFT calculates the lift capabilities of various Kaysam and Totex balloons along with predicted maximum altitudes.

Since many of the balloon manufacturers have a minimum order, I can provide small quantities of balloons and parachutes. Also I can provide a videotape suitable for club presentations, which summarizes most of the balloon flights, for $15 + $3 postage.

"My eventual goal is to send a balloon around the world!"

The Future

Plans are afoot for a crossband audio repeater, an ATV repeater, more live TV camera flights, and a dual-balloon packet linking experiment. These experiments will allow stations up to 800 miles apart to communicate via the balloon. Also, experiments will be flown attempting to control the return of the payload, either through a pressure release valve or a radio-controlled glider.

Sometime in 1991, an opportunity may present itself to fly a payload with a NASA research balloon from the National Balloon Scientific Facility in Palestine, Texas. The Balloon Facility sends up giant 500-foot diameter balloons carrying massive payloads of 3000 pounds or more (Photo J). Many of their balloons are made by Winzen Research in Sulphur Springs, Texas. They take nearly 160,000 cubic feet of helium to inflate. They can almost track the balloon's progress by the many UFO reports that come streaming in during the flight. My tiny payload will be hardly noticeable compared to these weights. These flights typically reach upwards of 140,000 feet and may stay at this altitude for some time. I'll fly a color camera on this flight since their retrieval success rate is almost guaranteed!

Also, I'll be attempting a few cross-country flights using a plastic zero-pressure balloon. A zero-pressure balloon vents excess helium at float altitude and does not burst. However, ballast needs to be released at night to stay aloft. My eventual goal is to send a balloon around the world!

Next month we'll examine some telemetry and payload electronics in detail. 73

You may contact Bill Brown WB8ELK at 73 Magazine, Forest Road, Hancock, NH 03449.

73 Review

by Joe Moell K0OV

1250 MHz ATV Downconverter and Antenna

Tuning in ATV repeaters the fun and easy way.

PC Electronics
2522 Paxson Lane
Arcadia CA 91006-8537
Tel. (818) 447-4565
Price Class: TVC-12G
Downconverter, $109
20624 Tonna Antenna, $70

Down East Microwave
Box 2310, RR 1
Troy ME 04987
Tel. (207) 948-3741
23LNA-WP Preamplifier, $100

Amateur fast-scan television (FSTV) is mushrooming. It seems like every ham with a video camera wants to get on and show off his cinematography skills. The availability of space shuttle video via satellite, and the recent ATV balloon flights by WB8ELK, have helped fuel the aerial television (ATV) excitement.

Several years ago I dabbled in ATV, mostly simplex on the 70cm band. That meant limited range for those of us who don't have the good fortune to live on a hilltop. Still, it was fun exchanging pictures with WA6IGY and the other locals. Since then, ATV groups nationwide have begun installing repeaters on various hilltops and mountains, giving everyone an opportunity to join the fun of longer range, high quality ATV.

Crossband repeater systems make it possible to operate duplex so you can see your pictures as others see them. Inputs are common ATV simplex frequencies such as 426.25, 434.0, and 439.25 MHz. Outputs are on coordinated frequencies in the 902-928 and 1240-1300 MHz bands.

My interest was rekindled when some of the local transmitter hunters began to shoot videos of their T-hunt escapades for "show and tell" on ATV repeaters in the Los Angeles area. Most of these repeaters have outputs on the 23cm band, so a new receiving setup was in order.

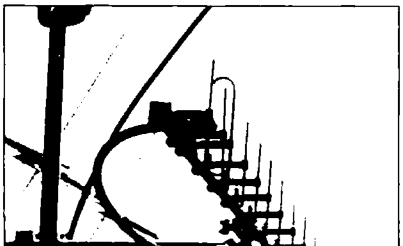


Photo A. The Tonna 23cm yagi, side-mounted with a home-brewed right angle adapter plate.

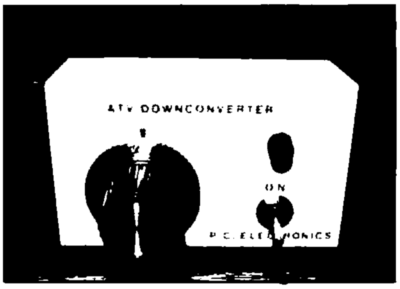


Photo B. The TVC-12G is built into a customized Ten-Tec box.

I like to build ham equipment, but I was intimidated by the thought of taking on a microwave project with limited test equipment. I'd rather spend the time making T-hunt gear. But good news! PC Electronics of Arcadia, California, had everything I needed. The simplest setup is the TVC-12G downconverter and the Tonna 20624 23-element yagi antenna. Two days after I phoned, the packages arrived.

ATV for the '90s

Tom O'Hara W6ORG of PC Electronics has been "Mr. ATV" in Southern California for many years. In that time, ATV rigs have progressed from crude conversions of bulky tube-type surplus gear (how many Motorola T44s have been put on ATV?) to little boxes full of GaAsFETs and other state-of-the-art goodies. The new downconverters make it easy to get into microwave ATV and get good color reception.

There are several pitfalls to getting good ATV pictures on the 23cm band. It's not like pulling up the rabbit ears to watch *Eye on Podunk* on Channel 7. There are two ATV repeaters viewable on 23 cm in the Los Angeles area: Mt. Wilson on 1241.25 MHz and Santiago Peak on 1253.25 MHz. There are some hills in the way so I can't see Mt. Wilson. My local repeater is on Santiago Peak at 5670 feet, but it runs only 25 watts of transmitter power into a 10 dB gain antenna. Compared to over 300 kilowatts ERP for TV Channel 7—let's see—that's 30.8 dB difference. The path loss attenuation increases with frequency, so there is 17.1 dB more path loss at 1253.25 MHz than there is for Channel 7.

You would think that getting good video under these circumstances would be impossible. Fortunately, we can make up much of that loss by using a high antenna gain (16.3 dBd). We also use a low-noise figure converter with a GaAsFET transistor in the front end. If that's still not good enough, you can add a GaAsFET preamp right at the antenna to eliminate system noise figure degradation by the coax downlead.

The 20624 antenna kit, part of the F9FT line, is a product of Tonna in France. The reflector and 21 directors are #12 AWG stiff rod, held in place 1-¾ inches away from the ⅝-inch, inch square boom by plastic spacers. You have to drive each element through its spacer and carefully center it, then snap it onto the boom. The fit is positive and tight, ensuring that all elements are at optimum spacing and won't loosen up.

Tonna has factory-connected the driven element to a short length of RG-213 coax, so all you have to do is snap it in and attach the high quality N fitting Tonna supplies. The tricky connection of coax to driven element has already been made and sealed in place.

The 20624 F9FT Antenna

Be careful when buying or ordering your F9FT antenna. Tonna makes two 23-element yagis for 23cm. The 20623 is intended for weak signal work above 1280 MHz, while the 20624 covers 1240-1280 MHz for ATV and OSCAR. The PC Electronics catalog sheets incorrectly list the 20623 antenna for ATV, but the company is actually shipping the correct 20624 model. *[Ed. Note: Present P.C. catalog shows correct number.]* If you order the anten-

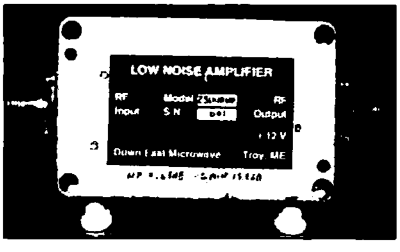


Photo C. The Down East Microwave preamp is a big help in microwave fringe areas.

na from another dealer, be sure you specify the 20624 for ATV.

The supporting mast must not pass through the plane of the elements.

This means that the antenna should be atop the mast for horizontal polarization. ATV repeater antennas are usually vertically polarized, so drill an extra pair of holes in the support bracket for side mounting, or use a homemade right angle adapter plate and short piece of pipe to side mount it as I did (see Photo A).

The 3 dB beamwidth of the 20624 is less than 10 degrees. This makes aiming a bit tricky. I suggest using a rotor with precision control instead of a TV click-click type. Forward gain is within one dB of spec from 1205–1271 MHz, but good transmitting SWR (1.25 or better) is limited to the 1250 to 1270 MHz range.

At six feet, the boom length of the 20624 is long enough for good gain, but short enough for easy mounting. It could be used portable or even mobile. (ATV T-hunts anyone?) If you need even more sensitivity, the Tonna 20650 55-element antenna has 3.4 dB more gain than the 20624. But its 15-¼-foot boom and 6.7 degree beamwidth make it harder to mount and peak up.

[Ed. Note: Dual 20624's stacked one over the other would give almost 3 dB improvement but with the same horizontal beamwidth. Also appropriate loop yagis are available from Down East Microwave.]

The converter draws only 50 milliamperes at 12 volts DC from a small wall supply. I don't understand why PC Electronics chose a 3/32 inch subminiature phone plug instead of a standard 5mm DC power connector. If the phone plug gets pulled part way out, it shorts out the 12 volt supply and could damage it.

Operation of the downconverter couldn't be simpler. Just tune in the repeater. You don't get detente channel tuning on this converter, but you don't need it. There is full tuning range in the 23cm band with the control on the front panel (see Photo B). The frequency control is not calibrated, and frequency is not marked. I found that there is a small amount of frequency drift in the converter, but it is easily handled by the AFC in the TV set or VCR.

Base Station Use

The lack of "detente" tuning, the drift, and the lack of dial calibration are not problems at home. But these attributes make this converter unsuitable for use at a remote site or a repeater. PC Electronics makes a crystal-controlled downconverter (TVCX-12) that's more suited to remote use.

The TVC-12G converter connects directly to the N fitting of the coax from the mast-mounted preamp and antenna. The converter's output is 181 MHz (TV channel 8) or a nearby unused channel in your area. The RG-6 coax from converter to TV set can be quite long without excessive loss at 181 MHz due to the 20 dB gain in the converter. This means that the converter box does not have to sit on top of the TV set, but can be positioned where it improves the system sensitivity.

In my case, I placed the converter box on a shelf above the workbench, right where the coax cable from the antenna comes out of the attic.

Smoke Test Time

The PC Electronics receiving setup works just fine. The antenna pattern is quite sharp. Weather conditions, including the familiar Southern California inversion layer, affect local propagation of UHF signals. That makes picture quality go up and down somewhat throughout the day.

You may notice apparent changes in rotator heading with time, too.

No, the mountain hasn't moved (not yet, anyway, after all this is earthquake country). The path has probably changed slightly.

Initially, my picture was very good, but not perfect, with a bit of color noise. Gee, why doesn't it work better? The answer came on the next smogless day (I had to wait a week). I had put the antenna/converter setup on the most convenient of several existing masts on my roof. My neighbor's tree stood between that mast and the mountain. Another pitfall! A leafy tree is as good as an attenuator at soaking up microwave signals—that's why a microwave oven cooks vegetables so well.

For best results, the antenna needs to "see" the repeater site. But even in the clear, multipath can cause poor picture quality by partially canceling the signal. I had to probe the roof with the antenna, converter, and a portable TV set to find the best "hot spot."

The TVC-12G, which uses a NE253 GaAsFET preamp, has a noise figure of about 1.5 dB. That's reasonable for an inexpensive GaAsFET, but it's not the ultimate state of the art. If your reception is marginal, or if you must have a long coax run to the antenna, consider a low noise preamp, mounted at the antenna.

The model 23LNA-WP GaAsFET preamp from Down East Microwave has a noise figure of about 0.7 dB. You might think that less than 1 dB improvement wouldn't be a big deal, but I made an A/B comparison between the preamp/converter combination and just the converter mounted right at the antenna. This test eliminated any effect of the coax lead-in. The Down East preamp gave a noticeable improvement.

PC Electronics recommends using the preamp if the antenna lead-in is more than fifty feet. (Low-loss Belden 9913 coax is recommended.) It's easy to modify the converter to apply DC power up the coax to the preamp, using W6ORG's directions. With the preamp, you won't be able to transmit up that coax, but that's unimportant when using a crossband repeater system like those in Southern California.

The Tonna antenna and PC Electronics Converter are now doing a fine job in my ATV station. Several other ATVers in the area use the same setup with good results. Right now, WA6PYE is sending a videotape of his last All-day T-hunt adventure, so if you'll excuse me. . . . 73

Joe Moell KØOV is also 73's "Homing In" columnist. You may reach him at PO Box 2508, Fullerton CA 92633.

Number 12 on your Feedback card

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

Super-RATT, RS Model 4, TNCs

Happy summer, everyone. If the burgers are frying and the soda is chilling, why not sit back and lounge a bit with this month's "RTTY Loop"?

Stewart Emery WA7VOT of Kent, Washington, dropped me a note asking about the availability of Super-RATT, the venerable RTTY program for the Apple II series of computers. Well, Stewart, I asked around a bit, and turned up zilch in the way of a new source. It appears that the program is no longer marketed; or if it is, I can find no evidence of same. With the more potent hardware turning up at every juncture, you might want to take a peek at that sometime. Until then, we'll keep the LED burning for you.

Scott Lieberman, M.D., a radiologist in San Jose, California, is interested in getting onto packet using a Radio Shack Model 4—when he isn't on 20 meter MRI (Magnetic Resonance Imaging), that is! Here is another user of an "orphan computer" looking in vain for that up-to-date terminal program.

Here, at least, we can fare a little better. A few terminal programs for the Model 4 are available, with at least one in the CompuServe HamNet library, I believe. Take a look for it, and again, ask around at a local user's group. Also check TANDYPRO and LSISIG for Tandy Model I/III/4 programs. If you want to run packet with the Model 4, you don't need a specialized packet program.

The TNC units you are looking at only require an ASCII terminal to run them, so about any communications program, such as one you might use to hook into a mainframe or modem, will be quite sufficient. No, they won't have all the bells and whistles, and my Dodge doesn't have a carphone, either, but it still takes me where I want to go!

Put 'em to Use

Speaking of old clunkers, I know I've said this before, but another letter, this one from John C. White WB6BLV struck a responsive chord. WB6BLV, a science teacher at Lindsay High School in Lindsay, California, is the advisor of the school's amateur radio club.

Do you have an old RTTY machine, terminal unit, transmitter, receiver, or just some GFPO equipment lying around in your basement? Why not call a local school, and see if an amateur radio club is around to act as a grateful recipient? Those young'uns will put your trash to use, learn in the process, and we all will benefit. 'Nuff said? Oh, well, if you insist. "GFPO" was the term used so often in the local MARS program during the 1970s, descriptive of the surplus equipment on its way It means "Good For Parts Only"!

RTTY Cross Display

I have received a few requests from recent RTTYers, who wonder how that famous RTTY cross display was produced. Well, all you need is a terminal unit you can get inside and an oscilloscope, and you, too, can light up your shack with the famous green glow.

The essence of creating the cross display is to feed the horizontal input of an oscilloscope with the output of the space detector of the terminal unit, and the vertical input of the oscilloscope with the output of the mark detector. Now, older terminal units made these signals readily available to monitor, and even some newer units carry on this tradition. Unfortunately, quite a few demodulators in between allow absolutely no access to these signals without cracking the case.

In that case, you are on your own, owing to the huge number of circuits out there. I will point out, though, that you are looking for the signals after they have been split, either with active or passive filters, and you should couple them through some small capacitors to the oscilloscope's horizontal and vertical inputs. See the figure for a generic version of the kind of hookup I am talking about.

To use this display, tune for equal amplitudes of the two arms of the cross, and your signal is centered within the passband of the demodulator. By tuning a bit more towards the mark, the vertical ellipse will be quite a bit larger than the horizontal. Tune on the space, and watch the situation reverse. Tuning shifts wider or narrower than the optimum becomes easier, as straddle tuning is aided by a visual display of how well the signals are being received. Remember, this is a window on the signals after they have passed the mark and space filters.

One thing to watch for, if you decide to build such a display, is a visual confirmation of the fading that makes diversity reception possible. Very often, you will see the mark or space *only* fade away, from a perfectly tuned signal. This rather narrow fading can knock out communication, without really destroying the signal. Thus, the ability to copy on either the mark or space, lacking true two-antenna diversity capability, remains one of RTTY's strengths.

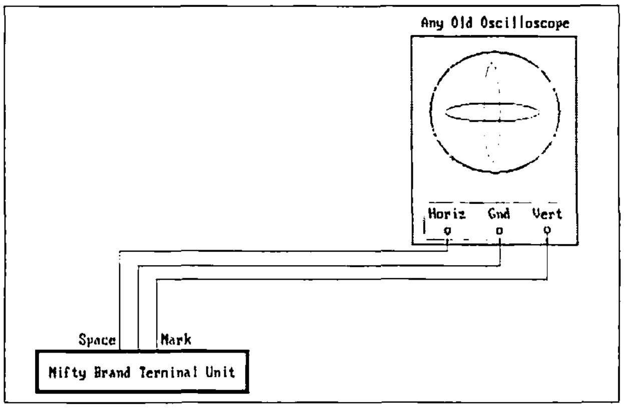


Figure. RTTY Tuning Scope.

One-Chip Projects

I asked about one-chip projects last month, and early returns are gratifying. Many of you have either ideas or questions that clearly apply to others on these modes. I have also been happy to read many of your comments regarding several of the products and services reviewed here in recent months. We have leads out for several more new and interesting items in the world of RTTY, digital communication, and computers, and are always interested in hearing your opinions as well. Drop me a line at the above address, or via CompuServe at 75036,2501 or Delphi at MARCWA3AJR. I'm always delighted to hear from you. 73

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston TX 77083

The Microsats—a Half-Year Later

How have the Microsats fared since the launch earlier this year? After six months in orbit there has been a little lost ground but a lot of progress.

During much of the first half-year of Microsat activity, DOVE (Dove-OSCAR-17) was silent on the 2 meter downlink due to software difficulties and the CPU crash in March. Command stations like N4HY could hear and decode the 2.4 GHz signals from the satellite using S-band receive systems in conjunction with DSP (digital signal processing) techniques, but those looking for the strong 2 meter FM packet and synthesized voice signals on 145.825 MHz heard nothing. During the recovery (see the June, 1990, "Hamsats" column) engineers were careful to ensure that no problems would occur when the 2 meter transmitter was enabled.

By the time you read this, DOVE should have a powerful 2 meter downlink with both packet and programmed voice messages. Every point on Earth is within range of the signals from DOVE at some time during each day. With nothing more than a simple VHF-FM receiver, anyone can listen to the digitally-encoded voice messages. Add a TNC (terminal node controller) and a terminal and the packet telemetry and messages can be received as well.

Many people have asked why the BBS systems for the Microsats took so long to activate. The Microsats were designed and built by AMSAT volunteers. The scientists and engineers responsible for creating the Microsats also have job and family commitments. In addition to the BBS programming, volunteers also handled the DOVE recovery, hardware experiments, the UoSAT-14 high-speed digital communication activity and worked with the WEBERSAT (Weber-OSCAR 18) camera.

The Binary Format

Experimental work with binary-format telemetry downlinking has begun via LO-19 (LUSAT-OSCAR 19) and AO-16 (AMSAT-OSCAR 16).

The early downlink format was standard ASCII, but a binary form is expected to dominate for both message uplink, telemetry and message downlink operation. It is more efficient, but requires that user TNCs (terminal node controllers) be commanded for KISS ON (Keep It Simple—Standard firmware bypass) and a separate program running in the user's computer to provide packet control.

To enable KISS, the command "KISS ON" is sent to the TNC. The TNC will reply that "KISS" was "OFF." Nothing will happen until the TNC is turned off and then on again or the "RESTART" command is used. At that time, the lights on the front of the TNC will flash a few times and the unit will be ready for external packet control with "KISS ON." Appropriate Microsat TNC software will soon be available without charge through BBS systems. Disks will also be available through AMSAT for a small fee to cover costs.

Originally KISS was provided to support the use of TCP/IP (Transport Control Protocol/Internet Protocol) software running in a host computer connected to the TNC. Almost all TNCs built since 1983 support KISS. It's only an inconvenience for those with computers to use software external to the TNC's internal programming, but is impossible for those with stand-alone terminals or computers not supported by available programs. The binary code will show nothing comprehensible on the screen.

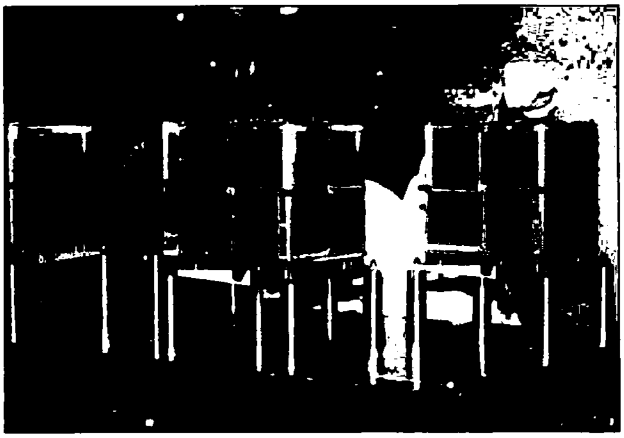


Photo B. Jack Crabtree AA0P making final adjustments to a Microsat prior to vacuum chamber testing. (Photo by WD0HHU.)

Photo C. The microsats with solar panel covers in place. (Photo by WD/0HHU.)

Stations that have been receiving and decoding pictures from WEBERSAT have been using the KISS mode in conjunction with N4HY's program TLMDC Version 3 to capture the binary picture files.

Data can be collected and saved to disk during a pass. Another program, Weberware 1.0, developed at Weber State University, decodes the files and presents the results on PC-compatible computers with at least EGA video capabilities. The latest version of the decoding software was on display at the Dayton Hamvention in April and can be purchased from AMSAT.

The binary format will not be used on DOVE unless BRAMSAT wishes to try it. A complete list of frequencies and modes for the Microsats appeared in this column in the May 1990 issue.

The Bottom Line

On the plus side, the amateur community has four operational Microsats. Upgrades to onboard operating sys-

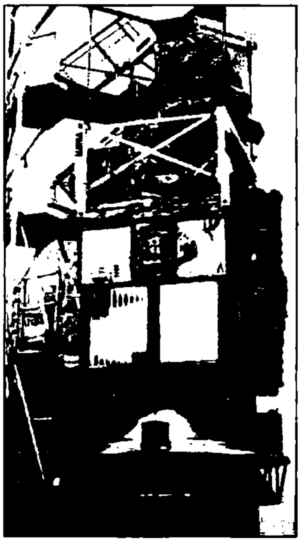


Photo D. The French SPOT-2 satellite dominates the scene while the microsats and UoSATS are attached below. (Photo by WD0HHU.)

Photo A. Jan King W3GEY and the Microsats during vacuum chamber testing. (Photo by WD0HHU.)

Photo E. WA5ZIB explaining the amateur satellite program to the Brazos Valley Amateur Radio Club near Houston. (Photo by N5MPN.)

lems may be long in coming, but the results are worth the wait. All four are healthy. Very few organizations in the world today, especially volunteer groups, could hope to get four satellites off the drawing board and into space in such a short time.

When final commissioning occurs, control of each satellite reverts to the groups sponsoring the individual satellites. DOVE is owned by AMSAT Brazil, or just BRAMSAT. LUSAT or LO-19 is the property of AMSAT Argentina and WEBERSAT belongs to Weber State University in Ogden, Utah. PACSAT or AO-16 is the only hamsat of the group that will be directly controlled by the operations arm of AMSAT North America. Although cooperation between groups is expected, the final say on schedules, software uploads and system activities is the responsibility of each organization.

AMSAT "ACs"

Nearly every ham club wants speakers to provide informative talks at their meetings. Anyone who has been in charge of organizing club programs knows how hard it is to find speakers. AMSAT has a group of volunteers called Area Coordinators. One of their jobs is to give talks about the amateur satellite program. With ten operational hamsats in orbit, and more on the way, there are enough fascinating topics to provide hours of information. There are ACs in all 50 states. To find one near you, give AMSAT a call at (301) 589-6062, or write to: The Radio Amateur Satellite Corporation, 850 Sligo Ave. Suite 600, Silver Spring, MD 20910. Don't forget to include a self-addressed-stamped envelope.

The Area Coordinators also help those with questions on a one-to-one basis, promote AMSAT at ham conventions, run local hamsat-oriented nets, give demonstrations at schools and provide assistance wherever needed to "get the word out" to the amateur community and the public concerning the amateur satellite program. ■

Yaesu Service Survey

Refreshingly flexible.

by Gordon West WB6NOA

After visiting a service facility, I can usually sum up my feelings about it in just a few words. Kenwood is "professional and firm"; ICOM is "cordially professional and reliable"; and Ten-Tec is "professional but relaxed." I would call Yaesu, subject of this month's service survey, "professional and very flexible." Believe me, this is not a contradictory statement!

While I waited for Customer Service Manager "Johnny" Johnson N6TVL to show me the service facility, I knew what I was in for. Overhearing Parts Department Manager John Lynn as he worked with a ham on the phone, I couldn't help but notice his interest in helping the customer: ". . .and after you take your handheld out of this set-up mode, you will be able to tune in 5 kHz increments. . .and by the way, if you have just a minute, let me tell you another trick that will make programming your new Yaesu 727 handheld a little easier. . . ."

Now that's refreshing—extra effort given in a casual, friendly way by Yaesu's technical phone personnel to make life easier for the customer working with a new and complicated dual-band handheld! Such one-on-one assistance speeds up the time it takes to learn all the transceiver's multiple functions.

The Yaesu Service Center is located in a new, modern industrial area in Cerritos, California. (This is scarcely a mile from where that Mexican airline came down after a firey tangle with a private airplane). The Yaesu service team consists of 15 bench technicians, plus many staff personnel that track all sets in for repair. Vice-President Chip Margelli K7JA says that most service personnel are U.S. citizens. All were busily working on equipment that was unbelievably small and complicated.

Johnson: "While most of our personnel are cross-trained to repair different rigs, we have some technicians that specialize in certain HF sets and VHF handhelds." However, he adds, "We cross-train as many of our personnel as possible—that way we are always ready when an abundance of VHF or HF repairs come in."

Every incoming piece of equipment is logged in on the computer. Included accessories are also noted. But "Don't send us your accessories unless they may have led to the repair problem," Johnson says. In other words, if you're sending back a handheld, remove the battery and rubber duckie antenna to cut down on weight and to minimize the number of items the technician must keep track of.

Give the Facts—All of Them

It was interesting to note that the customer's original letter describing the complaint is an integral part of the repair package. This hasn't happened at most of the other repair facilities; usually, someone transcribes the letter onto the repair form and the letter gets tossed. At Yaesu, the letter is packed right along with the computerized repair order form so the technician may read for himself the problem described by the client sending in the equipment.

"Never enough—never enough—never too much," says one Japanese service technician, reading a brief letter from a customer describing the problem. I can see what he means: "Radio doesn't work after 5 minutes." What does he mean? That the radio doesn't work on transmit? On receive? That the PL doesn't work after 5 minutes? Or is it the touch tones that don't work after 5 minutes?

Yaesu's service personnel suggest: "Describe the fault in as much detail as possible. Give us all the facts behind this set quitting. Tell us how it's mounted. Tell us what kind of antenna it's plugged into. Tell us more—tell us more!"

Identification, Please!

Margelli and Johnson led me over to a special bin marked with a giant question mark. Some nice rigs in here—three or four new handhelds, an FT-726 satellite base station, three 101s, and about four older 207s. All were completely repaired, just waiting to be returned to their rightful owners.

And waiting. . .and waiting. . .and waiting. Each of these radios had been sent in within the last six months with absolutely no return address, no letter inside, and no personal identification number found on the inside or outside of the equipment.

"It's hard to believe that someone would send us their $2,000 radio with absolutely no documentation, but it happens regularly," says Margelli. Are you missing a Yaesu repaired radio? If so, better figure out a way you're going to convince the Yaesu gang that one of these unclaimed radios is really yours! How does Yaesu personnel identify the rightful owner? "We have our ways," Margelli says with a smile.

Details of Yaesu Service

Every afternoon is phone time for some of the customer service technical personnel. They call customers to field questions or let them know that their unit has been fixed. Like most companies, Yaesu sends a postcard or calls the customer on the phone when their repaired equipment is coming COD, requiring cash or a cashier's check.

What are the average repair costs?

- High frequency sets: $125
- VHF transceivers: $75–$125
- VHF/UHF base stations: $75–$125
- Hourly rate: Approx. $50 with "oh my God" factor (difficult repairs that take substantially longer to fix than the actual repair charge indicates; the amount is adjusted depending on how many "oh my God" factors apply).

And what about the warranty?

- Warranty/parts & labor: 90 days
- New FT-1000 warranty: 1 year

All warranty claims for Yaesu equipment must be substantiated with a proof of purchase receipt.

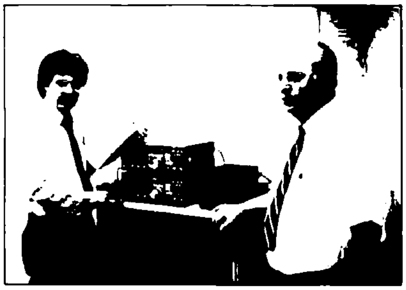


Photo A. Chip Margelli K7JA (left) and "Johnny" Johnson N6TVL (right).

Photo B. John Lynn providing customer service technical help.

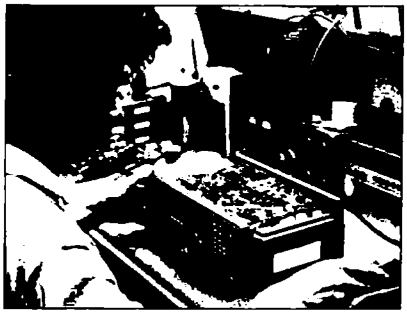


Photo C. Work begins on a base station zapped by lightning. Many lightning-struck rigs are unrepairable.

Yaesu's repair warranty is valid only for the original purchaser. If you are buying a relatively new set still in its warranty period, chances are the warranty will not be transferred to you.

•Biggest headache: Poorly packaged equipment that suffers additional damage in shipment. (Not the first time we've heard this one! Before you tape up the box, be sure your equipment is cushioned against impact. Don't use crushed newspaper; it isn't springy enough.)

•Common abuses and accidents: Dropped sets, lightning strikes, water & beverage damage (you say you keep your coffee warm on top of your FT-???), and cigarette smoke. That's right, the tarry substance in cigarette smoke builds up on the plates of tuning capacitors in the big HF transceivers. This causes the plates to accumulate dust, which in turn accumulates moisture. Eventually the caps arc, and once you've toasted some plates in this section of the final, the entire variable cap will need to be replaced.

"It's always a good idea to blow out the dust that has accumulated inside your set," says Margelli. "And if you are a heavy smoker, you might even take a look for yourself to see how much substance has built up on the plates of the caps—but," he cautions, "do this carefully, with the unit unplugged, and all capacitors safely discharged."

I asked Yaesu about the lithium batteries in their equipment. Will they ever go bad, requiring you to send the set back to the factory for reprogramming? The answer was a pleasant NO. The lithium batteries do not manage the CPU's operating system.

Out-of-band modifications are overlooked unless the modification affects the operation of the radio. "And we have plenty of out-of-bands attempted with a 300 watt soldering iron. This is an expensive repair," says one bench technician. If you plan to play games with your Yaesu for out-of-band reception, better leave it to a pro.

Well-Stocked for Action

Yaesu maintains a huge selection of parts. New, old, and antiques. Some dog-bone boards may be scavenged for parts, or trouble-free boards might even be used for replacements on older units to solve an intermittent board problem.

As for service manuals, Yaesu carries every technical manual back to the birth of the radio. Some may be copies of the original, but nevertheless they are available for the buying. "Parts and manuals normally turn around in about 24 hours when ordered," Margelli says. Items like tone boards, crystal filters, and flexible antennas are considered dealer sales, not parts orders. See your local dealer for these normally available accessories.

However, tubes are getting to be a problem at Yaesu, as they are at all other companies. That is, good tubes. For instance, finding good 6JS6s for the 101 series is tough. If you have some hanging around your shack, better hold onto them. Good tubes are getting more scarce every year.

More on Damage by Lightning

As noted above, lightning is a common source of damage. The phone customer service personnel frequently repeat this advice to amateur operators, especially those in the Midwest and South: UNPLUG YOUR EQUIPMENT, AND DISCONNECT THE ANTENNAS WHEN NOT IN USE!

Numerous radios come in that are completely in meltdown from a direct lightning strike. Most of these sets cannot be repaired. If you suspect a lightning storm is brewing, get your equipment completely off the AC, ground lines, and antenna lines. During an ocean race to Hawaii, my sailboat was hit by lightning, but my set faired well because I had unplugged it and rolled it up in a sleeping bag. That's one way to beat the lightning gods!

Yaesu gets some interesting repairs. Of course, the lightning repairs look like one molten mass with a resemblance of a dial as a blob in the front. While the former cannot be fixed, Yaesu accomplished an outstanding success on another unusual repair job—an FT-901 that was shot by a Panamanian bullet. The bullet went completely through three boards and exited through the top of the unit. There was no word on the condition of the operator!

Regional Service with GEES

Yaesu has recently contracted with General Electric Electronics Services to handle regional repairs. GEES is over 20 years old. The G.E. service lab normally calibrates electronic test equipment and repairs RF equipment. GEES has 22 facilities across the country. The Chicago operation is the pilot shop for this new service venture, with the Cincinnati operation acting as the back-up facility for Yaesu service. The GEES Compton facility in California will be the next shop to come on line, followed by one in Seattle.

Photo D. It's high tech in this environmentally-controlled calibration and alignment lab at the GEES repair facility in Illinois.

Gary Frisch WJ9G says, "Our only product is service, not new equipment. Every employee is involved in a single function, providing quality repair service. We also offer fixed pricing." Their fixed "cost to repair" includes labor and all parts, excluding major parts or equipment that has been seriously damaged by the operator. The GEES offers one-week turnaround time, and the fixed rate for most HF rigs is $140. Mobiles are $110 and handhelds are $80. However, call the GEES at (708) 595-4343 to double check the current price before you send your equipment in.

The General Electric group also repairs Kenwood equipment. As we pointed out in past service surveys, regional service centers, or in this case a GEES, might be the perfect solution for a fast repair, a guaranteed repair rate, or a difficult (unusual or complex) repair. Give the GEES a call if you live in the Central or East U.S.

Mailbox Comments

What do hams say about Yaesu service?

Fred Crouch WD9FBY was plagued with an FT-757 intermittent keyer. The repair charges were $120, which he felt was reasonable, and the service was prompt and thorough. "Service was faster than estimated. I was treated with courtesy and all the options available were explained."

Dean W5UNK comments that his 757 was repaired and "RF aligned," but when he checked it about a month later, it was 500 hertz off calibration, and the squelch only worked on FM. He also claims that the service manual is not up to date on this set.

Bill KA2OVR owns two Yaesu HTs, and he feels that they are excellent equipment. He says he hears negative comments about Yaesu, ICOM, and Kenwood service, and that the best service hams talk about is from Ten-Tec. He said he was willing to pay for expe-

Contacting Yaesu

Vice-President/Customer Service: Chip Margelli K7JA, of DX fame
Customer Service Manager: "Johnny" Johnson N6TVL
Hot Line: (213) 404–4884
Parts Hot Line: (213) 404–4847
•Incoming repairs should be sent directly to Yaesu, U.S.A., 17210 Edwards Road, Cerritos, CA 90701. Package it well!
•General Electric Electronic Services: (708) 595–4343
Contact GEES for regional service news, as new facilities are due to open.

dited repair, but Yaesu did not have that type of service. To our knowledge, no company offers expedited repair, but Bill ends his letter by writing that the service was "disgraceful."

Ken Freeland W1ANF sent his FT-980 in for a power supply 24 volt regulator fix. The repair cost about $100, which he felt was "a little high," but he gives the phone personnel stars for being helpful.

Margaret Foster WA6BWH says, "My Yaesu FT-23R has given me years of trouble-free service. It's been bumped around and dropped, but still continued to perform. Then one day it quit. Off to Yaesu, UPS. In less than a week, it was repaired and the price was right. I am happy with Yaesu service."

"It's a 'happy' company, and the spirit of the Yaesu personnel is indeed on the customer's side."

And James KC4ODF: "My FT-757 came back repaired in a month, faster than I had been told, and if UPS had been faster, turnaround time would have been less...I repaired my FT-2100B linear amp myself, and the person in the parts department knew the parts I needed. In one case, he had to pick the parts by hand, as they had been packed with the wrong part number. The one problem I could not find the cure for was taken care of by a telephone call to a technician named Ron. He knew the problem and the solution."

Here to Please

Approximately 10 other letters echoed the same fast and efficient service that Margaret Foster experienced with Yaesu. All commented that the equipment was repaired professionally, quickly, and at reasonable cost.

Visiting Yaesu was a casual delight. It's a "happy" company, and the spirit of the Yaesu personnel is indeed on the customer's side. I noticed one rig, after repair, was getting a complete scouring. "Chances are, he will probably think we sent back someone else's unit," a technician said, smiling, as he buffed up the face of an FT-101, previously brown from years of cigar smoke. "I could probably tell you the brand of cigar this operator was using, too! After this cleaning, it will look like a brand new set." He polished off the final knob.

It's that kind of personal care that makes Yaesu service a casual affair. True, in the past not all hams have been happy with Yaesu service—but with the new service program with GE, plus added service personnel and new test equipment, Yaesu is out there to please.

In the words of KC4ODF: "I have heard that all you buy is a NAME, and if that is true, I'll buy that NAME, one I can trust...I have found this in the people and products from Yaesu in Cerritos...

73 Review *by Ron Hranac N0IVN*

TDS Amateur Television System

Designed to your configuration.

T.D. Systems
242C Superior Drive, Suite B
Pantego TX 76013
Phone: (817) 861-5864
Price Class: See table.

Fast scan amateur television is a mode of communication that has been with us for a long time, but the last few years have seen incredible growth in the ranks of ATVers and new products to support that interest. While ATV equipment suppliers like PC Electronics and Wyman Research are familiar to most of us in the fast scan ranks, recent entries into the world of video include AEA with their FSTV-430a transceiver, and Yaesu's 23cm ATV module for the FT-736.

One of the newest ATV manufacturers to join in the fun is T.D. Systems of Pantego, Texas. Operated by Steve Franklin WB5KGL, TDS is producing equipment that redefines the "amateur" in ATV. Based around a compact transceiver control unit, a ham's operating flexibility is enhanced with the use of separate transmitter and receiver modules that can be mast-mounted to eliminate the need for expensive low loss coax. The control unit remains in the shack, with connections to the modules via inexpensive RG-59.

Whether your fancy is AM or FM video transmission, on-carrier or 4.5 MHz subcarrier sound, and simplex, crossband (full duplex), fixed, portable or repeater operation in the 70cm, 33cm or 23cm bands, the TDS gear can be configured to almost any combination you can imagine.

The Control Unit

The CU-125 ATV control unit (Photo A.) is the heart of TDS's fast scan gear. The front panel includes illuminated level meters for both audio and video modulation, and features momentary-contact pushbutton electronic switching for POWER on/off, MIC or AUX AUDIO input, SUB C (4.5 MHz audio subcarrier) on/off, XMIT, CAMERA or AUX VIDEO input, and XMIT FREQ selection between two transmit frequencies. Level controls for the microphone, auxiliary audio, camera and auxiliary video inputs are front-panel pots, as is the receive tune control. LEDs located above each pushbutton illuminate when the button is pressed, and two additional LEDs are located next to each meter to indicate audio and video clipping. The two LEDs above the XMIT FREQ button will let you know which transmit frequency is being used. The front panel also includes separate MIC and PTT jacks.

The rear of the control unit (Photo B.) is equipped with a number of connectors and switches; the following is a summary of the purpose of each one:

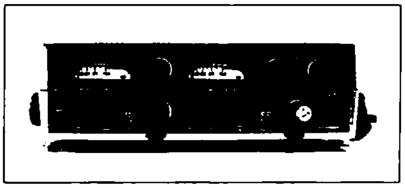


Photo A. The CU-125 control unit is the heart of TDS's ATV gear.

AUX VIDEO IN phono jack—This is a second video input to the control unit, and can be selected with the front panel AUX VIDEO pushbutton. You can connect 75 ohm, one volt peak-to-peak video sources, such as a VCR, second camera, color bar generator, or composite video from a computer or video game.

VIDEO MON OUT phono jack—This provides a sample of your transmitted video after clipping and low pass filtering, just before the line driver that feeds an external transmitter module.

DUP SIM switch—For simplex operation, the switch must be in the SIM position. This routes an internal RF modulator to the OUT TO TV connector when the transmitter is on, so you can see to your own signal while in the transmit mode. During receive, the receiver module's signal is routed to the TV. With the switch in the DUP position, the internal RF modulator is disabled, and the receiver module's signal is routed to the OUT TO TV connector when transmitting or receiving.

AM FM switch—For normal TV operation, this switch is left in the AM position. For FM video operation, an optional FM demodulator board must be installed in the control unit. When switched to the FM position, the demod's received video and audio are routed to the internal RF modulator to allow reception on a regular TV set. In addition, the receiver module input signal is connected to the demod, and the receive tuning control is applied to the demod board for AFC action. Next it's routed to the receiver module.

VIDEO TO XMIT F-connector—Using RG-59 or other low cost coax, this is connected to the F connector on an external transmitter module, and provides video and 4.5 MHz audio to the module as well as bias voltage when the front panel XMIT button is pressed.

F_1F_2 SELECT OUT phono jack—If a second crystal has been installed in the transmitter module, the center conductor of this connector should be connected to the green wire of the transmitter module wiring harness. This will allow remote frequency selection using the front panel XMIT FREQ button.

INT CR AUDIO TO XMIT phono jack—When on-carrier audio transmission is desired, this jack will provide pre-emphasized audio to the transmitter module. For on-carrier audio operation, this optional feature must be installed in the transmitter module (the fourth pin on the module power connector and white wire in the wiring harness are used for on-carrier operation).

AUDIO MON OUT phono jack—This provides a sample of your transmitted audio after pre-emphasis, clipping and filtering (before level adjustment) prior to the modulator stage.

	Prices, According to Configuration	
CU-125	Transceiver control unit	$229
	AM Transmitter Modules (Double Sideband)	
T70A	70cm transmitter module	$132
T33A	33cm transmitter module	$137
T23A	23cm transmitter module	$137
	2nd transmit frequency	$ 10
	On-carrier audio	$ 10
	FM Transmitter Modules	
T33FM	33 cm transmitter module	$138
T23FM	23 cm transmitter module	$138
	FM demod board for CU-125	$169
	Receiver Modules	
RVT70	70cm downconverter	$ 89
RVT33	33cm downconverter	$103
RVT23	23cm downconverter	$109
	crystal-control RX option	$ 30
RCC10	Downconverter control box (allows stand-alone operation of a downconverter for AM reception without the need for CU-125 control unit)	$ 54
C70	70cm indoor downconverter/receiver	$109

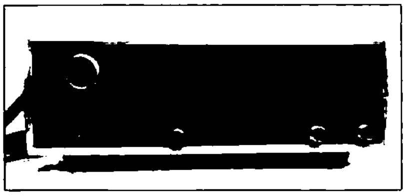


Photo B. External connections are made on the rear panel.

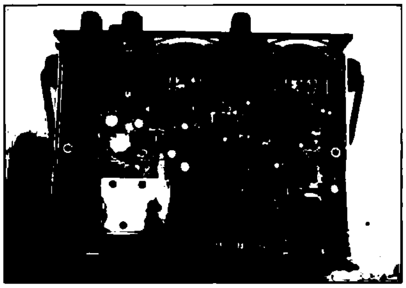


Photo C. The CU-125 control unit's quality is evident in its construction.

AUX AUDIO IN—This is a second audio input to the control unit and can be selected with the front panel AUX AUDIO button. Line level sources such as VCR audio outputs can be connected.

TO REC CONV F-connector—The external receiver module is connected here with RG-59 or equivalent. This provides operating power to the module, and is the receiver's IF input to the control unit.

OUT TO TV F-connector—This provides VHF channel 3 or 4 to a regular TV set and allows monitoring of received signals during simplex or duplex operation, as well as transmitted signals during simplex operation.

CAMERA 10-pin connector—This is a standard 10-pin connector for a video camera that provides power to operate the camera, and video and microphone inputs from the camera.

12 VDC IN cable—This is for connection to an external DC power source (10.5 to 15 volts). Built-in regulation circuitry compensates for voltage fluctuations, and provides the required internal operating voltages. Because of this, it is not necessary to readjust the control unit's internal blanking pedestal or sync stretcher if the operating voltage changes.

The control unit is housed in a smart looking plastic case 8"W x 2½"H x 6¼"D, not including the rubber mounting feet, front panel knobs or folding support bracket. The whole thing weighs just over a pound. When the control unit's power is first turned on, MIC, CAMERA, and XMIT FREQ F_1 are automatically selected. If you use 4.5 MHz subcarrier audio, then SUB C must be pressed each time you turn the power on (it would be nice to be able to change the default to have the subcarrier come on at power up).

The quality of workmanship is excellent, with parts layout and construction definitely in the "professional" category (Photo C.). The control unit includes a sync stretcher circuit for compatibility with external RF power amplifiers.

External Modules

The actual transmitter and receiver modules are in 3¾" x 4¾" x 1⅝" die-cast aluminum Hammond housings (Photo D.), and can be mounted at the antenna or some other location remote from the control unit. This allows the use of inexpensive RG-59 coax to interconnect the modules to the control unit. For connection to their respective antennas, the modules are equipped with 50 ohm female N connectors.

The transmitter modules also have a small 4-pin power connector and come with a short wiring harness that includes a plug to match the power connector on the module. This wiring harness contains a +12 VDC line (red), ground (black), and frequency select line (green). There's a white wire for on-carrier audio operation. If the transmitter module is mounted any distance away from the control unit, you will have to splice in a longer multi-conductor cable. The modules are built using surface mount device technology (Photo E.), with the circuit boards and external connectors in the lids of the housings.

All of the receiver modules have low loss internal bandpass (preselector) filters followed by GaAsFET front ends for out-of-band signal rejection and low noise performance. Conversion gain is around 20 dB, with an IF output in the VHF television low band (50 to 90 MHz). Standard configuration is for tunable receive using 10 to 15 VDC for tuning across the desired frequency range. Receiver modules may be changed to crystal control with an optional add-on board; frequency F_1 is then selected by applying 10 to 12 VDC, and F_2 is selected with 12 to 15 VDC. Frequency control voltages are fed from the control unit to the module through the interconnecting coax.

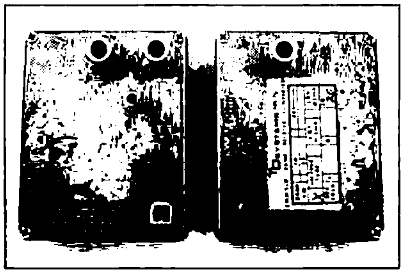


Photo D. External transmitter and receiver modules are enclosed in small Hammond aluminum housings. The second N connector on the transmitter module interconnects to a receiver module for in-band simplex operation.

Photo E. The modules use surface mount device construction, with all components in the lid of the housings.

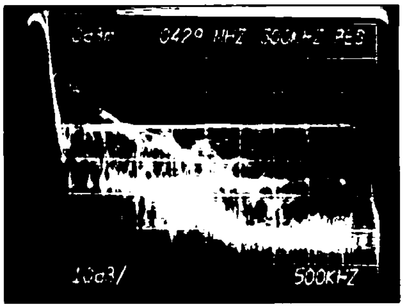


Photo F. TDS transmitter in-channel video frequency response measured with a SIN X/X test signal is good even by broadcast standards.

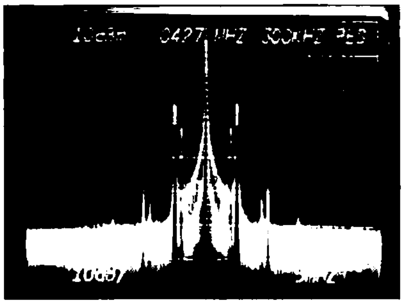


Photo G. The transmitted RF spectrum is clean; an external attenuator was used to keep the 2 watt signal from overloading the spectrum analyzer.

Transmitter modules can operate on two output frequencies. AM modules use crystals (output frequency divided by 64), and the FM modules use two diode frequency programming banks. Even though the transmitter modules have external power through the 4-pin connector, the module won't actually transmit until video and bias are present on the coax that interconnects the module and control unit. AM operation is available on 70cm, 33cm and 23cm; FM operation is available only on 33cm and 23cm. 70cm output power is rated at 2 watts (sync tips); 33 and 23cm output power is 1.25 watts (sync tips for AM and carrier level for FM).

Performance

The configuration I tested included the CU-125 control unit, a T70A transmitter module, and an RVT23 receiver module. The transmitter module was crystalled for 426.25 MHz and 439.25 MHz operation with 4.5 MHz audio subcarriers (on-carrier audio was not installed), and the receiver module was the standard tunable version (1240–1290 MHz). This setup allowed full duplex operation and compatibility with Denver's crossband ATV repeater.

The control unit's current consumption at 13.8 VDC was measured at 0.46 amp with both modules connected and in receive mode; with a camera powered through the rear panel's 10-pin connector, current was 0.75 amp. Turning the transmitter on increased the figures to 0.51 amp and 0.81 amp, respectively. The transmitter module required a separate 0.43 amp (transmit mode) through its wiring harness, for a total of 0.94 amp without a

camera and 1.24 amps with a camera.

Actual output video carrier frequencies were 426.2503 MHz and 439.2504 MHz, with the 4.5 MHz audio subcarrier at 4.500981 MHz in both cases. The transmitter's second harmonic was −64 dBc, and with the audio subcarrier set to −20 dBc and 1 volt of video applied at 87.5% depth of modulation. The 920 kHz beats were −40 dBc. I also noticed some beats 1.25 MHz either side of the video carrier, but these were −62 dBc and did not produce any visible interference in the picture. The video level meter read just over 100% with 1 volt of video input and depth of modulation at 87.5%. The audio level meter read about 70% with a 1 kHz tone input and 25 kHz peak deviation. The clipping LEDs came on at 95% depth of modulation and 30 kHz deviation, respectively.

CW output power was 1.58 watts, and with video modulation applied, this increased slightly to about 2 watts on the sync tips. In-channel video frequency response was extremely flat at better than 0.5 dB peak-to-valley (see Fig. 6). With the 4.5 MHz audio set to −24 dBc and video modulation at 87.5%, the double sideband spectrum was quite clean (Fig. 7).

The transmitter was then connected to a Mirage/KLM D24N-ATV power amp, and the CU-125's pedestal and sync stretcher controls adjusted for best operation. Using a 10 element KLM yagi, picture quality through the Denver ATV repeater (22 miles away) was a solid P5. Even with the 4.5 MHz subcarrier set to −24 dBc, there was no audible noise or buzz in the sound.

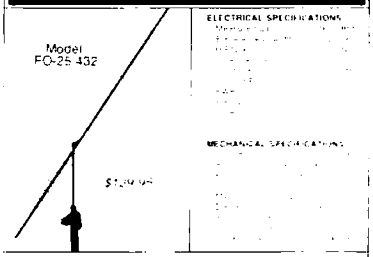
I was able to test the receiver module on a Hewlett-Packard 8970B noise figure meter, and the module's noise figure (including its built-in preselector filter) was nearly flat across the 6 MHz spectrum at about 2.2 dB. Conversion gain was 20 dB at the video carrier frequency, and about 19.5 dB at the upper 4.5 MHz audio subcarrier frequency.

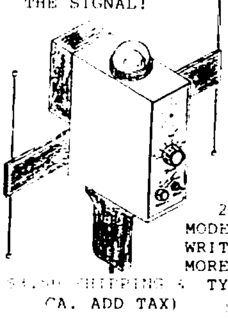
Even after continuous operation for up to an hour, the equipment was only warm to the touch. I installed the modules near the control unit, since I have only 30 feet of Belden 9913 coax between each antenna and the shack. With a received carrier level of −57 dBm from the repeater, the TDS receiver module provided crystal clear pictures.

Comments

On-air use for several months has confirmed what I measured during this evaluation. The TDS equipment's transmitted and received picture, color, and sound quality are better than other ATV rigs I have used in the past, and picture sharpness is visibly better. The TDS receiver module performs extremely well under relatively low signal level conditions and in the presence of strong out-of-band interfering signals that make pictures on other units almost unwatchable.

I do have two complaints, though. Documentation needs improvement, and delivery is slow. These two items aside, TDS has some excellent ATV equipment. For user flexibility and product quality and performance, it's hard to beat. 73





Model Rocket ATV

Warp-Speed Television.

by Bob Rau N8IYD

In 1987 the model rocket *Argus II*, a developmental vehicle for technological testing, flew for the first time. The payload of the 4-inch diameter, 101-inch tall rocket housed a Sony XC-37 black and white CCD camera, and a PC Electronics TXA5 ATV transmitter. With Blake W8MNT as control operator, the *Argus II* lifted off using an Aerotech H120 and four Vulcan G-44 rocket motors, the equivalent of almost 40 Estes D motors.

Preparing the Argus II

I had mounted the camera horizontally on the rocket, with a mirror in an external housing. During ascent, the mirror looked down the side of the rocket at the ground; after ejection, the mirror flipped out of the way and looked at the horizon.

I had also removed the XC-37's internal power supply and made a little PC board so the camera could sit horizontally. The TXA5 had the frequency selection relay removed and the crystal soldered in to make the unit more immune to shock and vibration.

There was also a radio control uplink to activate a backup parachute and tracking smoke. Nine alkaline AA cells powered the entire system. I designed the rocket to be as light as possible, using a balsa and fiberglass tubing superstructure. The body tubes could be lightweight Estes BT-101, since they were just an aerodynamic skin. With motors, the entire stack weighed just under 6 pounds.

Ready for Launch

We started preparing for the launch early in the morning. I set up my ATV receive site a hundred or so feet from the launch pad with a backup receive site down the road. The site got the best video using a simple Radio Shack corner reflector. We also had a third receive site, the ARROW Communications Association ATV repeater (W8MNT/R) 20 miles away in Ann Arbor, Michigan. By early afternoon we were ready for launch, although with some minor problems. The video transmitter was interfering with the radio control receiver a little. This caused the servos to jitter, which in turn caused the power bus to fluctuate a little from the servo motors. The power fluctuations showed up as random white bands on the video. Except for the interference, things looked good for a launch.

. . .3, 2, 1, LAUNCH (See Photo B). One G-44 motor started before the rest, creating a nice smoke cloud a second before lifting off. Although not the most efficient way to get a rocket off the ground, the video was fabulous! We watched the rocket race away from the ground on a tower of smoke (see Photo C). Through the repeater, the video was seen 26 miles away in Tecumseh, Michigan. A snag in the recovery system caused the parachute not to deploy, which damaged both the launch vehicle and the payload section, but the electronics sustained very little damage.

Photo A. Carolyn KA8ZWM and Bob N8IYD with Argus IV.

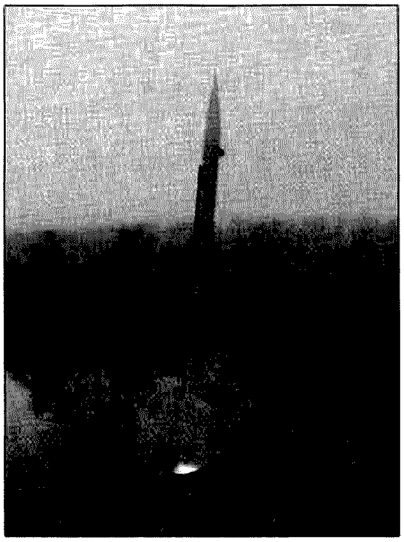


Photo B. Liftoff of Argus II!

The Next Rocket

The next goal was for more altitude. I ran several computer simulations to find the most economical way to reach an altitude greater than one mile. Rocket motors costing what they do, I chose to redesign the rocket using a 2.6-inch diameter tube. This smaller diameter would allow me to achieve nearly 60% more altitude for the same motor and mass. Using an Aerotech J125 (equivalent to about 70 Estes D motors), I could reach my mile-high goal. Since I was designing a new vehicle, I also wanted to expand the technical goals. I decided to design an on-board flight computer and overlay telemetry on the video downlink.

In addition to all the new hardware I now had to design and build, I had to figure out how to shoehorn the PC Electronics TXA5 into a usable area 2.25 inches across. It was about an inch too wide, and I thought I would have to design my own transmitter, a task I was not up to. Blake W8MNT studied the PC board and suggested I simply saw the board down to size. I thought Blake was kidding; that's like wanting a mini HT and sawing a larger one in half to get it! But Blake showed me that if I sawed the sync stretcher side, I would damage very little of the circuitry I really needed.

After more than a month of considering other options, I set up the drill press with a Dremel cutting disk. Then, lowering the Quill to 2.25 inches and locking it into place, I said a quick prayer and sliced the board. Then I removed the partial components from the sync stretcher. The replacement circuitry was put on a perfboard at the RF output, bringing the length to 8 inches.

While working on the TXA5, I was also designing the new flight computer and video overlay. Now, anybody in their right mind would be honoring the time-tested rule: "Keep It Simple, Stupid!" Right? Not me. I kept wanting one more thing. Furthermore, I had set a standard board size of 2.25 by 4 inches, with double-size boards at 2.25 by 8 inches for the transmitter and camera. The flight computer needed so many chips I had to use surface mount and stacking sockets. I packed 15 ICs and 13 connectors onto a single-size board (see Photo D and Figure 1). The board had a 9 x 3 jumper matrix for configuring the I/O, analog input, RS-232, serial peripheral I/O, battery backup for 32K bytes of RAM, 3 servo outputs, power, TTL parallel, 2 high current outputs, and switch input connectors.

I chose the Motorola MC68HC11 microcomputer because it has many on-chip I/O'S and Motorola provides plenty of free support. The MC68HC11 has the following I/O on the chip: UART, high speed serial I/O, EEPROM, timers, pulse accumulator, parallel

Photo C. ATV payload rising on a plume of smoke.

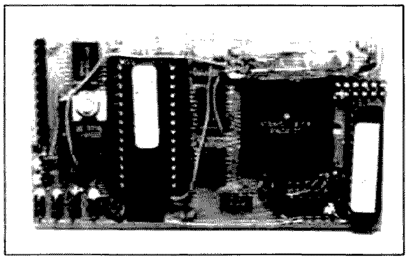


Photo D. MC68HC11 flight computer.

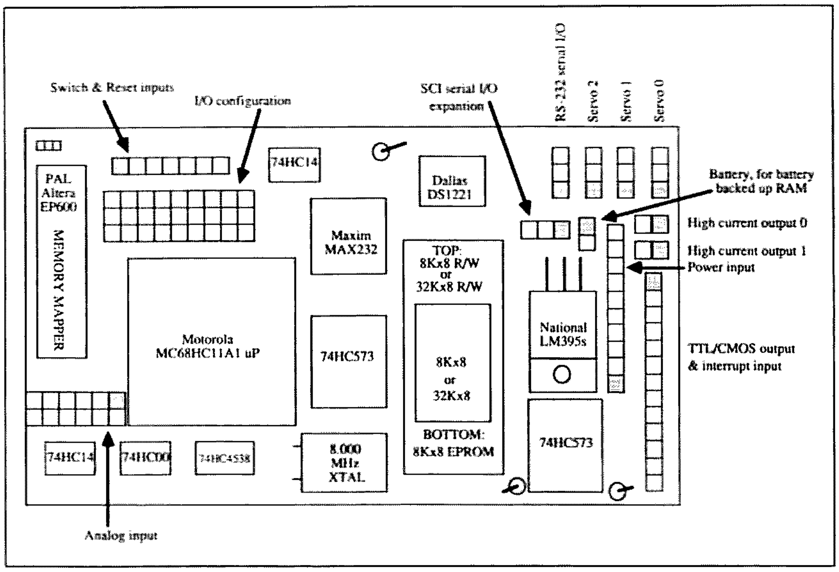


Figure 1. Flight Computer layout.

ports, and an 8-channel, 8-bit analog-to-digital converter. Motorola runs a Freeware BBS in Texas with cross-assemblers, BASIC interpreter (called BASIC11), hex monitor (Buffalo), C cross-compilers, and more, for this micro. The cross-assemblers and cross-compilers are ported to the Apple Macintosh, Amiga, and IBM PC/XT/AT clones.

The BASIC11 was fast enough to hook the vertical sync to the interrupt on the micro and have the video overlay time-stamp each individual video field! A job far beyond the BASIC for the Intel 8052H and some others I looked at. The only drawback of BASIC11 was that it didn't support floating point math, but this was not a problem for our application. A long-time friend of mine, Jud Nichols, wrote a device driver for BASIC11 so that printing to the video overlay was as simple as the BASIC11 statement: 10JPRINTJ#3,"SPEED=";S1

The device driver saved us from having to use POKEs and the like to talk to our custom video overlay circuit. The device driver supported an addressable cursor, clear screen, backspace, and most of the ASCII character set. The BASIC11 interpreter was burned into an EPROM and the BASIC11 source was burned into another EPROM.

I had designed, layed out, etched and built three circuit boards: the MC68HC11 MPU board, the power supply board, and the camera carrier board with video overlay circuit. The analog board for signal conditioning the sensors for air pressure and temperature were put on a protoboard. Batteries and the internal mirror for the video camera were mounted on blank 2.25 by 4 inch boards. All boards were this size, except for the camera/video overlay and the modified TXA5, which were 2.25 by 8.0. I then had a plug machined to allow me to cast card guides into 4-inch lengths of coupling tubing. The coupling tube with two PC boards installed solder-side-to-solder-side would then slide into the 2.6-inch body tube of the payload section (see Photo E and Figure 2). But the camera and mirror board were so tall they couldn't fit in with the other boards. This modular approach made payload design easy and quick to change.

The Second Rocket

Argus IV, 104 inches long and weighing 7 pounds, 1 ounce with the Aerotech J-125, was finally done (Figure 3). I decided the *Argus III*, still unfinished, would carry a 5.3-inch diameter Polaroid camera. The *Argus IV* payload was substantially more sophisticated than *Argus II's*. We used a stock Sony XC-37 and tapped into internal test points for horizontal and vertical sync to drive the video overlay. There were two pressure sensors, one for altitude and the other for velocity. There was also a low mass thermistor for measuring instantaneous temperature during ascent. A mercury switch used as a binary G switch monitored motor burnout. Battery voltage and mission elapsed time were also displayed.

The first line of telemetry included my callsign and the mission elapsed time in 1/60th of a second. The second line displayed speed, altitude, temperature, battery voltage and some status bits displayed in hex. (See Photo F, taken before calibration.) The camera had an internal mirror to look out of the body

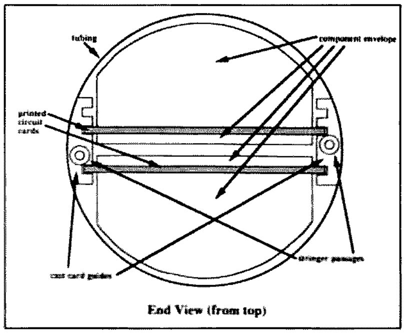


Figure 2. Rocket tube section with card guides.

tube, and an external mirror to look down the side of the body tube at the ground. The external mirror hinged in such a way that when the ejection charge separated the rocket, the external mirror would flip out of the way, allowing the camera to view the horizon (see Photo G).

The Flight Of Argus IV

Our first flight of *Argus IV* was in Danville, Illinois, at an advanced rocketry meet. I had coordinated this flight with some of the local ATVers in the area and told them I expected to fly at 10 a.m. As luck would have it, while setting up, an internal connector came loose and delayed the launch until 2 p.m. I was unable to make it into any of the FM repeaters to advise them of the delay, so no one else saw the flight. Due to a snafu before launch, we didn't get the computer reset correctly and never got telemetry. Oh, well.

...3, 2, 1, lift off! Unlike *Argus II*, this bird rolled like a bullet. After a few seconds, the image became so blurry you could only make out large objects on the ground. The motor burned for about 10 seconds and the roll rate reached 2 rps before burnout. Before

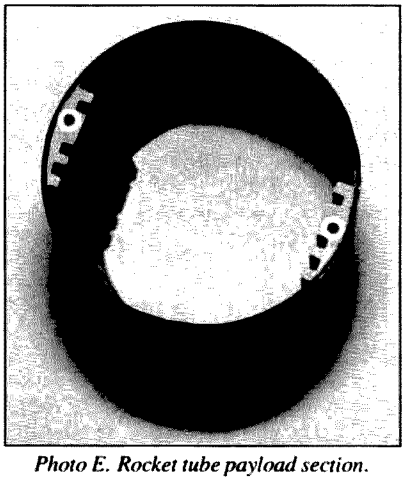


Photo E. Rocket tube payload section.

Photo F. On-screen video overlay telemetry.

the rocket reached apogee, the roll rate had almost stopped and you could see fields and roads. Even without the telemetry, the flight was a great success.

I could never have accomplished these flights without the help of family, friends and the people mentioned above. I owe special thanks to my wife who got her Novice with me, helped build rockets, let me buy hundreds of dollars of gear to support each flight, drove with me across country for the flights, and took most of the pictures in this article. . . and is still married to me!

After Argus IV

The rocket and payload visited Dayton in 1989 and I gave a talk about it at the ATV forum. The telemetry electronics then went on to do service on two of Bill Brown WB8ELK's balloon flights. Bill grafted the flight computer, power supply board, sensor analog board and a copy of the video overlay board, onto a balloon payload.

I am currently working on a compact, video-only payload where I hope to have most of the electronics in a short, 4-inch payload section. A key requirement for this is an ATV transmitter small enough for the task. I discussed this problem with Tom O'Hara from PC Electronics at Dayton 1989, and he in turn discussed it with other people, and came up with the TXA5-RC ATV transmitter.

The World's Smallest

This exciting 2.25- by 4-inch transmitter, introduced at Dayton 1990 (see Photo H), is the smallest ATV transmitter board on the market. Should the size fool you, this is no slouch. The output power is 1.5 watts peak, up from 120 mW on the old TXA5. This transmitter also has a new feature: adjustable

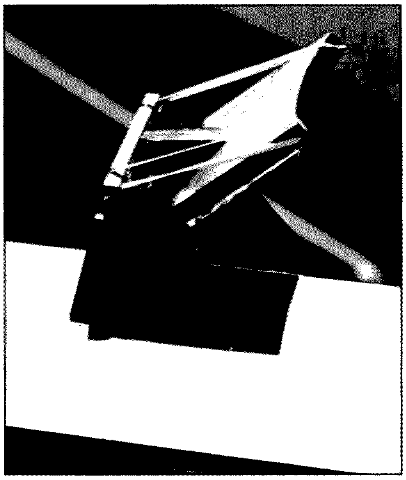


Photo G. Mirror mount for video camera.

transmitter output power. You can adjust the output power from 100 mW to 1.5W (with a B+ of 14 volts). This is important for two reasons:

First, this allows you to adjust your current consumption from 225 mA to 350 mA to get the best picture quality while prolonging the life of your batteries; and second, if you are using a radio control system, you can reduce your output power so you don't desense your radio control receiver input.

This transmitter also has solder pads for an SMB or SMC RF output connector. If you prefer, you can still solder the coax right to the board as on the old TXA5. Johnson PC mount SMB connectors are available from Digi-Key for less than two dollars each and mating females for less than five dollars. The video input and power have no facilities for connectors; you must solder the coax/hookup wire to the PC board. Although this board lacks audio input, it does have an audio carrier input so you can add the FMA 5-E sound subcarrier board. The sound subcarrier board is only 1.5 inches by 4 inches.

There is an adjustable sync stretcher circuit in the video modulator similar to PC Electronics's larger transmitters. The board has a crystal-controlled oscillator in the RF section near 106 MHz, one-fourth the output frequency. Therefore, any harmonics are kept out of the frequency range of the R/C receivers and the 2 meter voice coordination channels. There is also a demodulated RF output test point to aid in video adjustments, should

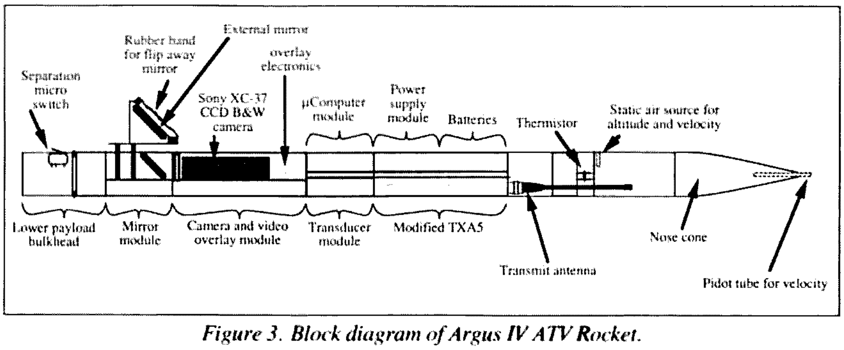


Figure 3. Block diagram of Argus IV ATV Rocket.

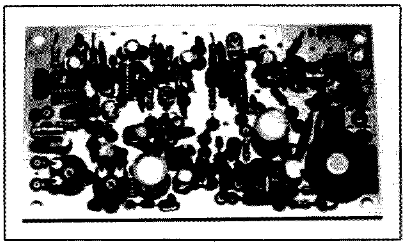


Photo H. P.C. Electronics TXA5-RC ATV transmitter.

you want to reset the output power or change the frequency.

Weighing less than 60 grams with SMB connector and power cable, this is an ideal ATV transmitter for ATV rockets, R/C Airplanes and balloons. The very small size is well suited for rockets and model aircraft. The hefty 1.5 watt peak output is also enough for the high altitudes of balloons.

The documentation includes a description, specifications, mounting, frequency readjustment, power readjustment, and instructions for video settings, as well as a schematic and parts placement diagram.

I took the transmitter over to Blake W8MNT's house and checked out the new TXA5-RC performance. We were pleased; the board had good frequency response through 4 MHz. We measured the output power to be roughly 1 watt at 13.6 volts.

The output driver transistor has a single tier heat sink which got too hot for me to touch. For installations and conditions with restricted ventilation, such as a rocket on the pad waiting for liftoff, I recommend a larger heat sink with thermal grease. I used a Thermalloy Heatsink 2228B from Active Electronics for this application.

Small cameras are now becoming available at prices around that of a new HT. GLB has introduced a camera that Bill WB8ELK had at Dayton 1990 in the *ATVQ* booth. Although just black and white, the image quality was very good, the low light sensitivity was excellent, and the size and weight were ideal for rocketry.

Availability Of Parts and Software

I have decided to make available some of the electronics and hardware to build a refined version of *Argus IV*. For more information, contact High Technology Flight, a division of RP Industries, 1450 Jeffery St., Ypsilanti MI 48198-6319. Tel. (313) 482-2670. On-line BBS (300/1200 baud) (313) 482-2657.

The TXA5, TXA5-RC and FMA5-E are available from PC Electronics, 2522 Paxson Lane, Arcadia CA 91007-8537. Tel. (818) 447-4565.

You can obtain Thermalloy Heatsinks, SMB connectors, and other electronics parts from Active Electronics, 133 Flanders, Road Westborough MA 01581. Tel. (800) 677-8899. SMB connectors and other electronics are also available from Digi-Key, 701 Brooks Ave., South Thief River Falls MN 56701-0677 and Motorola Freeware BBS 300/1200/2400 baud, (512) 891-3733.

R/C Helicopter ATV

Making ATV history.

by Juan Rivera WA6HTP

For most of the past year I have been learning to fly radio controlled model helicopters. It's a challenging hobby, and it appeals to me as a ham and pilot of full-size helicopters. Today's R/C models, especially helicopters, are extremely sophisticated mechanical marvels capable of amazing feats of aerial dexterity, and they're loaded with some very fancy electronics. They have to be!

Helicopter Aerodynamics

You see, as the pitch of a helicopter's main rotor blades is increased, not only does lift increase, but drag increases as well. This requires more power from the motor, and the throttle must be advanced to maintain rotor rpm. When power is increased, torque also increases. The torque reaction will tend to yaw the helicopter in the opposite direction from the direction of the main rotor rotation. To compensate, the pilot must increase the pitch of the tail rotor blades. This is one of the most challenging aspects of flying a full-size helicopter.

Any change in one control requires immediate corresponding adjustments in several others. And if that weren't enough, a helicopter is aerodynamically unstable. That's why a pilot's hands and feet are in constant use. You'll never see a helicopter with a hand microphone in it. A helicopter pilot can't let go of the controls long enough to reach for it!

Taming the Beast

R/C model helicopters are capable of amazingly quick movements due to their small size, and manually controlling all these things can be a real handful, especially since the pilot does not have the luxury of looking out the front windshield, and can't use his feet. To overcome this problem, three channels—main rotor pitch, throttle, and tail rotor pitch—are electronically mixed in a helicopter R/C radio system. When the main rotor pitch is changed, the throttle and the tail rotor pitch are automatically adjusted according to mixing curves which are entered and stored in the R/C transmitter.

In addition, most R/C helicopters use a rate gyro to help stabilize them. When the helicopter yaws, the gyro feeds an error signal proportional to the yaw rate to the tail rotor channel. This error signal is mixed with the normal control input and immediately adjusts the tail rotor pitch to help keep the helicopter pointed in the direction the pilot intends. These features make flying much easier.

Helicopter R/C Radios

To remote control a helicopter, you need a minimum of five channels. My radio system uses pulse code modulation (PCM) and transmits in the 6 meter band. I use seven channels for the following: roll axis, pitch axis, throttle, tail rotor pitch (yaw axis), rate gyro sensitivity HI/LOW, main rotor pitch, and unused ON/OFF function.

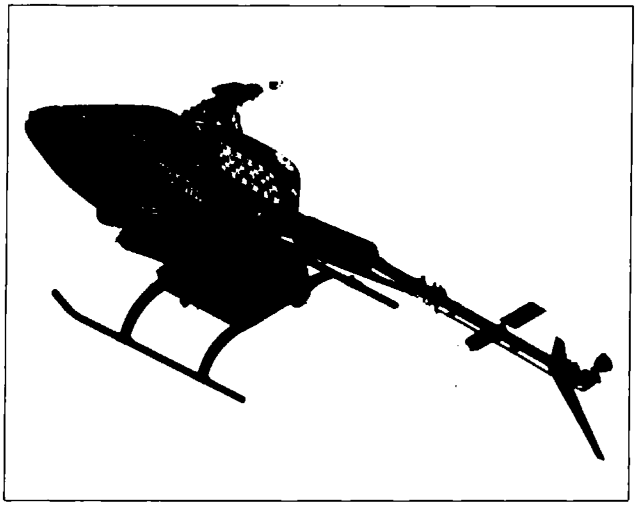


Photo. The six-foot long, 11.5 pound helicopter can go over 60 mph in three dimensions.

The more common radios use pulse position modulation in which the position of a control varies the position of a pulse within the transmitted data frame. With PCM, a digital word is transmitted which defines each channel's value in binary. In my system the word contains 10 bits, which resolves to 1024 possible positions of the servo. With a total control movement of only an inch or so, that's pretty tight control! As an added advantage, this method allows the application of digital error checking and correction techniques.

The R/C transmitter downloads preset fail-safe settings for all channels at regular intervals which are stored on board the receiver's microprocessor. The receiver constantly compares incoming data with previous data. Any gross change indicates an error condition. Should this happen, all the servos will either maintain their last valid settings or slave to their fail-safe positions, depending on how the R/C system has been configured. This feature allows the helicopter to "fly through" areas of low signal strength or interference.

To appreciate the level of sophistication in current R/C equipment, consider this: My receiver is constructed almost entirely using surface mount technology and weighs only 1.3 ounces. It is a dual-conversion superhet with both ceramic and crystal filtering, dual AGCs, and internal voltage regulation. This type of system is not only technically advanced, it's also very reliable and robust.

Sophisticated Aircraft

My helicopter kit is manufactured in Germany by a company called Schluter. The helicopter itself, almost identical in construction to its full-size cousin, is an absolute marvel of mechanically precise components and composite materials. The six-foot long, 11.5-pound helicopter is powered by a two-horsepower motor and can fly like the wind. Good pilots can perform every mind-boggling aerobatic maneuver imaginable, including hovering in inverted position.

So here we have a machine that can move effortlessly and precisely through the air at any speed from zero to over 60 mph in three dimensions. And it can easily lift several pounds, limited only by the pilot's ability to see and control it.

Airborne Amateur Television

Once I mastered the basics of flying my helicopter, it didn't take me too long to think of putting a TV camera on board. I ruled out carrying a miniature camcorder for two reasons. First, it has been tried without much success. The vibration and g-forces in that kind of environment are high, and the weight of even the lightest camcorder is a problem. A VCR's tape path and head-to-tape penetration must be maintained precisely for it to record properly, which is difficult to do in the presence of vibration and acceleration. The second, but most important, reason is that I wanted immediate gratification.

Looking at a tape is not as much fun as watching a live picture. (Only the spectators get to watch since the pilot must keep his eyes on the aircraft at all times.) Also, inadvertent and unexpected ground contact can sometimes occur, even when you have reflexes like a young mongoose, and mashing a camcorder into the ground could get expensive. Nope. It had to be a live picture!

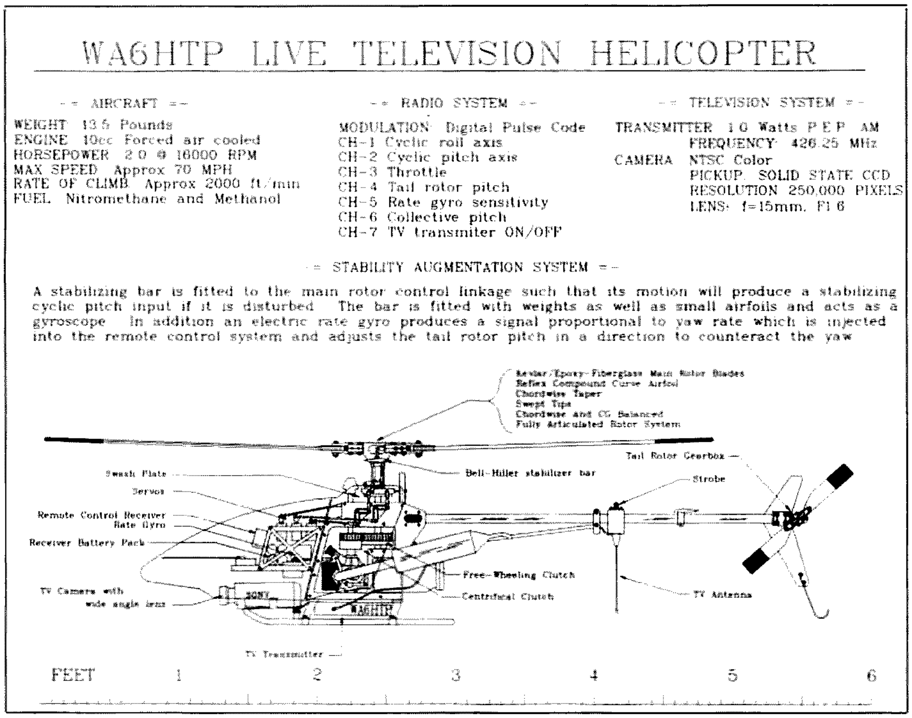


Figure. The WA6HTP Live Television Helicopter.

Selecting a transmitter was easy. One look in the radio amateur handbook convinced me that it would be simpler to purchase one ready made than to build one. I decided on a one-watt 450 MHz transmitter from PC Electronics. It also has an audio subcarrier.

For my camera, a friend loaned me a very small Sony HVM-322Q monochrome designed for surveillance use. About the size of a pack of cigarettes, it weighs 6.7 ounces and draws 0.9 watts. Surprisingly, it uses a half-inch Saticon tube rather than a CCD. And it has an auto iris and built-in microphone!

I mounted a quarter-wave whip straight down on the tail boom and trimmed it for minimum reflected power. TNC connectors and miniature Teflon™ coax keep the weight down.

After building a mount for the camera and a transmitter enclosure of 1/16-inch plywood lined with copper foil, I was ready for my first test. It was far from a success. The TV transmitter's RF got into the camera, and worse, the R/C receiver went completely crazy. When you have a machine swinging a five-foot blade at over 250 mph, loss of control is unthinkable. I had to completely eliminate RFI problems from the radio control link or it would have been too dangerous to fly. It looked like I would have to actually put some effort into the project if I was to succeed.

Beginning Again

As the helicopter kit comes from the factory, there is a metal control rod that travels from the tail rotor all the way to the servo tray in the nose. This rod was close to the TV antenna as well as the R/C receiver, and looked like a major suspect. In addition, the R/C receiver came with a long-wire antenna which extended out the back and was hooked to the tail with a rubber band. The rod was very close to the TV antenna. Obviously, both had to go.

I replaced the metal control rod with one made of nylon, and went to a short base-loaded R/C antenna which mounts in the nose and points forward. That gave me the benefit of cross-polarization and physical isolation. Then I set about bonding every metal part to the main frame of the helicopter.

Shielding—More is Better

I also modified the foil-lined plywood enclosure by adding RF suppression filters to all lines entering or leaving. They are rated at a minimum of 55 dB of attenuation at 450 MHz. These four steps completely cured the R/C receiver's RFI problems. However, the camera was still being clobbered. RF radiation from the antenna was the culprit. When transmitting into a dummy load, everything was fine.

By wrapping the camera like a mummy with adhesive-backed aluminum foil, I was able to greatly reduce the problem, but I couldn't completely eliminate it. I discovered that RF was actually getting in through the lens optics. The signal levels on the face of the tube are infinitesimal, and it doesn't take much RF to make its way into the video preamp. As a last resort, I added a piece of thin-mesh copper screen right over the lens. Finally, I had a picture with only a small amount of interference.

ATV Historical Event

At this point, I may have made amateur television history. I believe I'm the first person to actually crash an R/C helicopter right through an apple tree while transmitting a live picture. Branches, leaves, and pieces of apple flew everywhere. Whew!

I had just gone for a "personal best" altitude record while flying from my back yard. I had it up several hundred feet when I realized I didn't yet know how to fly well enough to have a prayer of a chance of getting it back in one piece. Talk about a sinking feeling! Well, at least I have a great tape to play at parties.

After becoming experienced with the system, I realized that one watt is much more power than needed. This exacerbates RFI problems and requires larger and heavier batteries than necessary. Since the transmitter is AM, dropping the power is not simple, since the modulator would have to be redesigned. PC Engineering also makes an 80 milliwatt transmitter so I immediately took the coward's way out and sent off for it. It didn't have an audio subcarrier, but I was tired of listening to the motor, anyway.

Having assured myself that television could reliably be transmitted from the helicopter, I decided to purchase a color camera. Using the 450 MHz handie-talkie, I tested several cameras for RFI susceptibility. CCD cameras turn out to be much less sensitive to RF than tube-types. Vibration-induced microphonics are also greatly reduced. The camera I chose was a Sony CCD-G1S. It has an auto iris, a tremendous illumination range, and great resolution. It's considerably bigger and heavier, weighing about one pound, but the helicopter had proven its ability to carry the weight easily. Meanwhile, I had managed to wipe out the 80 milliwatt transmitter so I returned to the one-watt version. This time the results were excellent! Flying at an altitude of several hundred feet, you can clearly see the helicopter's shadow as well as good detail of people on the ground.

Now I have a reliable and mature color TV system which I fly almost every weekend. It's a great crowd pleaser and a joy to play with. I use a small 8mm Sony video Walkman™ to tape each flight and display video on a larger nine-inch monitor for viewing at the site. And the unused seventh channel on the R/C system was put to use driving two solid state relays which control the TV system.

Future Images

Results have been so encouraging with this simple system that I am preparing to test-fly a miniature broadcast quality 2 GHz transmitter on loan from the manufacturer. I'll be running tests at KTVU-TV, where I am employed. We'll be using our existing 2 GHz electronic news gathering (ENG) equipment.

This will give us the ability to put the helicopter on the air live from just about anywhere within a radius of several hundred miles, using a system of mountaintop repeaters, as well as a mobile ENG repeater truck. That's something to anticipate! ■

Juan Rivera WA6HTP, 354 Marshall Drive, Walnut Creek CA 94598.

73 INTERNATIONAL

Arnie Johnson N1BAC
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N. Swanzey NH 03431

Notes from FN42

As I am writing this column, the news reports that devastating tornadoes almost wiped out the downtown and surrounding area of Limon, Colorado, during the night (June 6/7). Since I grew up in a tornado belt in northeast Kansas, I feel very concerned for the residents of Limon.

One item in the report caught my ear: There were no communications in or out of the area until TV news teams from Denver, 70 miles to the northwest, arrived several hours later. I asked myself, "What about hams?" The closest repeater listed in The ARRL Repeater Directory *was at least 60 miles away, quite a haul for an HT or mobile unless the repeater is on one of the 10–14,000-foot mountains west of Denver and Colorado Springs.*

Not that there should be more repeaters in each community; I am just wondering if any hams provided other sources of communications, such as HF or packet. I also wonder if community leaders had emergency plans for such circumstances, and whether local hams were involved in the planning and implementation of the plans.

This is just one instance of many disasters reported around the world daily. Were they prepared? Are we prepared? If we aren't ready or don't know, are we willing to do something about it? Get involved, help yourself, and help your fellow man. The next disaster may be yours.

And now on to the many happenings around the world.—Arnie N1BAC

Roundup

Egypt From *Egyptian Echos.* In 1986 Egyptian radio amateurs teamed up and formed a society for the first time in about 50 years. Egypt Amateur Radio Society (EARS) is now five years old, and growing! It is a giant step towards reviving a civilized, sophisticated and scientific hobby about to vanish in Egypt.

Egypt was once the only country in all Africa and the Middle East with a radio amateur society. Egyptians had even practiced amateur radio before some European countries did. But the situation today is deplorable. In a country with 55 million inhabitants, there are only about 25 radio amateurs.

It is a shame that a country of our size and stature has only this insignificant number of amateurs, while countries new to the hobby have thousands of amateurs. Let us look at the statistics to dramatize the issue. Malta has 352 amateurs, Cyprus 530, and Israel 1350—the small populations of these countries notwithstanding.

Why are there so few amateurs in Egypt? Well, the problem is twofold. First, there are bureaucratic hurdles that must be removed if the hobby is to thrive in Egypt once again. Second, we cannot vindicate ourselves, Egyptian amateurs, of our role in the build-up of the current situation.

Contrary to public belief, the solution to the first part of the problem is easy. We can meet with senior officials and they will definitely take all actions needed to straighten up things. It is always the rule that the higher you go up the governmental hierarchy, where visions become broader, the easier issues can be resolved.

The bigger part of the problem, however, rests with us—Egyptian amateurs. It is our duty to go out and inform the masses of this great hobby. This newsletter is intended for that purpose, but it cannot, and should not, be our only effort towards educating the public. We should do our best to recruit new amateurs, if we really love this great country of ours. We can go to universities, high schools, social clubs, and wherever potential amateurs may be found, and hold seminars on amateur radio. We can contact newspapers, magazines, and radio and TV stations to report our problems and reach out to the large sectors of Egyptian youth. There is reason to believe that these channels of mass media will be more than happy to help us and carry our message.

Radio amateurs in the whole world are known to be nationalistic, and Egyptian amateurs should be no exception. So, let us roll up our sleeves and get to work. The task may be difficult, but here lies the challenge. And if we don't do it, who else will?

[How many of you readers can substitute your country's name in place of Egypt and have this article give truth to your situation? It hits the nail on the head: "If we don't do it, who else will?"—Arnie]

Egyptian Echos is a monthly newsletter (temporarily published bimonthly) of the Egypt Amateur Radio Society (EARS). It is free of charge; send an SASE to be put on the mailing list of the next issue. Send news, views, comments, and correspondence directly to the editor. Editor: Dr. Hamed Nassar SU1HN, PO Box 1578, Alt Maskan, Cairo, Egypt. Bitnet:nassar@egfrcuvx. AMTOR: SU1HN@NKDZ(ORG = 14072 MHz).

Japan. From *The JARL News.* The Japan Amateur Radio League (JARL) proudly announces its Ham Fair '90, to be held at the New Hall (Shinkan) of the Tokyo International Trade Center at Harumi, Tokyo. The fair will run from Friday, August 24 through Sunday, August 26. Admission FOR ALL 3 DAYS will be 900 yen for adults and 400 yen for children under 15.

This fair, which last year attracted 59,000 visitors from 14 different countries, expects to welcome several local as well as foreign dignitaries, and we urge you to join us at this amazing event. Special commemoration station 8J1HAM will be operating from Ham Fair '90.

Another item from *The JARL Newsletter:* In order to improve measures for dealing with disasters more effectively, the Ministry of Posts and Telecommunications (MPT) made a plan to observe and research the actual state of disaster following the earthquake in San Francisco. To meet the request of the Ministry, JARL sent Director Yoshio Arisaka JA1HOG along as a member of the "Mobile Telecommunication Group" under the leadership of Mr. Kamei of the Ministry to research the extent of emergency communication by amateur radio.

The Mobile Telecommunications Group arrived in Washington, D.C., on January 31 and from there proceeded to New York and San Francisco. They visited the ARRL, and among other things observed actual, on-the-spot outstanding situations of emergency communication during the disaster, and a new communication system at FCC and AT&T.

[How many of our countries have sent hams to study emergency communication in other countries? Apparently Japan's MPT realizes that hams can make a difference in emergency situations.—Arnie]

South Africa From *The SARL Bulletin.* Following a petition against the introduction of a novice licence from individual radio amateurs, the Postmaster General (PMG) asked the South Africa Radio League (SARL) to table details of the proposal at the AGM. The draft document was discussed recently and the concept unanimously approved by the delegates present. Some branches asked that the introduction of a novice licence be expedited. These sentiments were conveyed to the PMG who assured the SARL that the matter was receiving priority attention. The draft regulations are currently at the legal department and are expected to be presented to the Minister for approval within the near future.

Other news: Reno Faber ZS6OF and Peter Strauss ZS6ET (*73* Hambassador) attended the IARU Region One meeting in Spain. This was the first time in six years that the SARL was represented.

Taiwan. From a letter from Frank Eskuchen, W9ZNY/BV: *From the Outside. . . Looking In.*

When the business brought me to Taiwan in 1970 to open a factory, the normal business problems kept me away from ham radio. Came 1973 and I met Tim Chen. Came 1974 and we erected his first beam, a 3-element, 20 meter high-gain, and thus starts my story.

About 10 years ago a typhoon rolled the beam and we replaced it with one of the same type. It is still in use today.

The China Radio Association, sponsor of club station BV2A/BV2B is to be honored and commended for its effort to broaden the base of ham radio in Taiwan. Through the years they have helped a succession of improvements in equipment, location, publicity, and with government relaxing the regulations, a fine overall ham atmosphere.

This letter could be filled with stories about Tim Chen, but that has been well said in magazines and radio journals. Enough that he is my best friend.

Let's look at what has happened here from an outsider's standpoint. (Hardly an outsider; I live here, pay taxes, and ride the "Daredevil Taxies.")

I vividly recall in 1974 when the association awarded me a beautiful plaque for assistance in installing the beam. I was filled with humility to think that this group was so appreciative of my small efforts. It was later shown to my radio club in Florida, not as my achievement, but as an indication of the style of members of the China Radio Association.

What has really changed the ham picture in Taiwan, and what are the effects locally and internationally? Tim has been the grinding force with his unselfish push for more operators and stations. With its new operators and stations, the ham world now looks on Taiwan as a friend of ham radio. This bulwark of friends is important to any nation. As one listens to ham radio, one can see that it is non-political and non-economic. A vast improvement.

The opening of Taiwan ham radio to groups of operators from friendly nations to operate for a limited time, contacting other operators, was great. Ham operators around the world were anxious to work (talk to) a station in Taiwan; Tim tried gallantly for years to meet their demands. Many previously frustrated hams can now say, "I have worked Taiwan," and thank the government for permitting these expeditions. Perhaps the most dramatic change from an outsider's viewpoint is the recent ruling that a visiting ham may operate from a Taiwan station when the Taiwan operator is present.

With Taiwan an outstanding electronics exporter, many electronics experts and buyers, who are also hams, travel through Taiwan every day. The question "Can I operate?" can now be answered "Yes!" To the visiting radio amateur, Taiwan has moved into the Developed Nation status, as most nations permit this [third-party traffic].

Almost as important as the legal changes are the physical changes. For the visiting expeditions, a permanent, fine location was found on top of a 14-story building with wide areas on the roof for all types of antennas. It makes for outstanding signals and wide coverage. Through the kindness of one of the association members (Mr. Hu) the basic station is now in a penthouse atop a 12-story building, with a door to the roof and access to all antennas. What a signal output! Very impressive!

What else to say, and where to go? Like most projects of a worthwhile nature, this goodwill ham radio station did not come about by any single effort. The members of the China Radio Association and the Taiwan government are to be commended.

What for the future? Nothing is perfect, but it is hard to see any changes that would improve international relations at this time. With the liberation of the rules and cooperation of Taiwan operators, the occasional pressure to license foreigners is not important. From a local standpoint, the opening of 2 meter frequencies would be great. With such a large group of electronic experts in Taiwan, it could bring many to ham radio and would be a step for foreign hams.

In closing I want to convey my thanks to the CRA for their kindness, and remind them of these many accomplish-

ments. They go far beyond the borders of Taiwan. Sometimes we are so close that we do not see. I see for all of you *[Frank Eskuchen, W9ZNY/BV, c/o PO Box 30-547, Taipei, Taiwan, Republic of China.]*

BRAZIL

Carlos Vianna Carneiro PY1CC
Rua Afonso Pena 49/701-TIJUCA
20270 Rio de Janeiro-RJ
Brazil

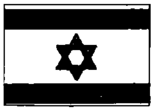
PQ2—Tocantins—
A New Brazilian State

Due to its continental dimensions, geographical characteristics, economic and political interests, and national needs, Brazil now and then creates new states by means of strategic divisions of its territory, to enhance desired development in some not-so-developed areas.

Tocantins State, the latest state created, is the result of the political and geographic division of Goias State, the northern part of which now forms an ample area right in the center of Brazil. For us radio amateurs, this means a new prefix, PQ2, and the excitement of hunting a new one for our files. Some lucky guys here, working for the airway companies, are starting a kind of DXpedition to Tocantins State whenever their planes land there, and heavy pileups and plenty of QSOs pay for their efforts.

Brazil now has 27 different prefixes for Classes A/B radio amateurs and 10 series from PU1 to PUØ for Class C beginners, 10 ZY series to the 10 Regions from 1 to Ø (islands included), and still several ZV-ZW-ZX and ZZ for special calls. Very special calls can go to usual contest winners, provided that they have been among the 5 first places in 5 international contests.

Keep an eye on Brazilian calls, you prefix hunters, for QSOing the whole Brazilian series! *[Carl sent a list of the prefixes and class information, but it is too lengthy to place in the column. Check for it on the 73 BBS in 73 International SIG as "Brazilian Callsigns." —Arnie]*



ISRAEL

Ron Gang 4X1MK
Kibbutz Urim
Negev MPO 85530
Israel
Packet: 4X1MK@4Z4SV

No More Banned Countries!!!

For the last 43 years since our country gained its independence, relations with our neighboring countries have been somewhat less than friendly, to say the least. This has been reflected by the general prohibition of amateur radio contacts with those countries not having signed a peace treaty with Israel. DXers going after a coveted spot in the DXCC honor roll have resorted to all kinds of devious means to secure QSLs at the risk of losing their licenses.

Now, after lobbying by the Israel Amateur Radio Club (IARC) the authorities have rescinded the ban, and there are no more out-of-bound countries.

Here is a translation of the historic document which was addressed to Mr. Joseph Obstfeld 4X6KJ, the chairman of the IARC on the 25th of March 1990: "We are happy to inform you that our office has agreed in principle to your request and has decided to cancel the prohibition, applying to Israeli radio amateurs, to contact the countries cited in Appendix 'C' to the conditions of the amateur radio station license (Algeria, United Arab Emirates, Bahrain, Tunisia, Jordan, Kuwait, Lebanon, Libya, Maurtania, Morocco, Sudan, Syria, Oman, Iraq, Saudia Arabia, Qatar, Popular Democratic Yemen and Republican Yemen *[The two Yemens are now one country.—Arnie]* The repeal will go into effect, beginning with the date of this letter and an announcement to the effect will be sent directly to all licensed radio amateurs. . . ."

This repeal of the banned countries list reflects the kind of thinking that we hope will lead us into an age of enlightenment. The media in Israel have taken keen interest in the move, although at first glance it would seem that the possibility of DX hunters being able to make some more countries should be no big deal to anyone. However, here is another channel of communications being opened to our neighbors, and it can only tide well for the future. Ham radio means people talking to people, and countries are, after all, people.

IARC Representatives
Return from Spain

Peleg Lapid 4X1GP and Rod Roden 4X8RR are home after having represented the IARC at the International Amateur Radio Union (IARU) Region One convention at Torremolinos, Spain, attended by representatives from 47 countries. Some of the main topics dealt with were: presenting a united stand at the upcoming World Administrative Radio Conference (WARC), where there will be strong pressure put on our frequency bands; band plans; reducing the number of contests on the air; and electromagnetic compatibility of equipment.

After being nominated by the Hungarian delegation, Ron 4X8RR was elected Monitoring System Coordinator for IARU Region I.

It was announced that the Agency for the Exploitation of Space and the Institute for Space Research at Haifa's Technion University are at work planning an Israeli satellite with amateur radio aboard for educational purposes.

In the closing assembly, the session's chairman read out the official letter of the IARC chairman regarding the repealing of the banned countries list, and received overwhelming applause from the delegates!

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the June issue, we should receive it by March 31. Provide a clear, concise summary of the essential details about your Special Event.

AUG 3-5

OKLAHOMA CITY OK Central Oklahoma Radio Amateurs will sponsor the 17th annual Ham Holiday which will also be the ARRL Oklahoma State Convention, at the Lincoln Plaza Convention Center. Doors open at 8 AM Saturday and Sunday and at 7 PM on Friday. Admission is $8 advance, $10 at the door. Flea Market tables are $7 in advance, $9 at the door. Banquet tickets are $8.50. Scholarship fund tickets are $2 each or 3 for $5. VE Exams. Talk-in on 147.03+ and 444.20+ (PL is 141.3). Send registration to *CORA, P.O. Box 95942, Oklahoma City OK 73143-5942.*

AUG 4

LANCASTER PA The Red Rose Repeater Association is sponsoring its annual Computer Fest at the McCaskey High School. Vendors 7 AM, public 9 AM-3 PM. Admission $4. Children under 14 free with a paying adult. Tailgating on first come basis (if weather permits), $5 per space. 8' tables $22 each. 5 or 6' tables $18 each. Tables resold unless occupied by 10 AM. Advance reservations and info: *James Linville, 399 Lampeter Road, Lancaster PA 17602. (717) 291-9050.* Please enclose a SASE. Talk-in on 147.015/.615.

AUG 4-5

JACKSONVILLE FL The Greater Jacksonville Amateur Radio & Computer Show will be held at the Prime Osborn Convention Center from 9 AM-5 PM Saturday and 9 AM-3 PM Sunday. Registration $5 at the door. Tables $12 for Saturday only or $15 for the weekend. Power at extra charge. For swap tables, contact *Wade Rhyne AJ4J, Box 11882, Jacksonville FL 32239.* For other information write *Greater Jacksonville Hamfest Assn., Box 10623, Jacksonville FL 32207.*

AUG 5

BERRYVILLE VA The 40th annual Winchester Hamfest, sponsored by the Shenandoah Valley ARC, will be held at the Clarke County Ruritan Fairgrounds, Rte 7, from 7 AM-3 PM. Gate admission is $5, children under 12 and spouses free. Advance admission is $4 with SASE before July 15. Tailgaters and limited tables, $7. VE Exams at 9 AM in Cooley Elementray School, across from Fairgrounds. Talk-in on 146.22/.82 and 146.52 simplex. For further info contact *Walter Johnson WA4HVU, at (703) 667-1474* or write *SVARC, PO Box 139, Winchester VA 22601.*

CROOKED LAKE IN The 1st annual Land of Lakes Angola Hamfest will be held at the Steuben County 4-H Park from 6 AM-2 PM. Free parking. Camping available. Advance donation $3, $4 at the door. Table charge $5. Trunk sales $2. For tickets and info write *Land of Lakes Angola Hamfest, PO Box 465, Fremont IN 46737.*

RANDOLPH OH The Portage ARC, Inc will sponsor its fifth annual Hamfair at the Portage County Fairgrounds from 8 AM-4 PM. Tickets are $3 advance, $4 at the gate. Children under 12 free. Indoor tables $8 each, flea market spaces $3 each. Computer hobbyists welcome. Mobile check-in on 145.390-. Contact *Joanne Solak KJ3O/8, Portage ARC Inc., 9971 Diagonal Rd., Mantua OH 44255. (216) 274-8240.*

AUG 11

PARKERSBURG WV The Mid-Ohio Valley ARC will sponsor a Hamfest from 0800-1700 local time. Free parking. Admission $2. Talk-in 146.145/.745, 146.37/.97 and 146.52 simplex. Contact *Ron Ferrell WD8RGZ (614) 423-5482* or *Bill WF8U (304) 485-7777.* Or write *MOVARC, 1810 Staunton Ave., Parkersburg WV 26101.*

RHINELANDER WI The 11th annual Rhinelander/Tomahawk Swapfest, co-sponsored by the Northwoods ARC, The Tomahawk Repeater Assoc., the Oneidea County ARES and the Rhinelander Repeater Assoc., will be held at the Rhinelander Ice Arena from 9 AM. Set up at 7 AM. Admission $1. Free tailgating. Auction at 1 PM. 3' x 8' tables can be reserved for $5 each. Talk-in on Rhinelander repeater 146.34/.94. Tomahawk repeaters 144.83/145.43 and 223.76/222.16. Contact *Leonard Bauman K9RMN, 804 Lincoln St., Rhinelander WI 54501. (715) 369-3296* or *(715) 369-5564.*

PETOSKEY MI The Straits Area ARC (affiliated with ARRL Club #1083), will sponsor its 15th annual Swap Shop from 8 AM-1 PM at the Fairground's 4H building. Admission $2.50 at the door. Tables $3 for 8'. Splits allowed. Self-contained RV parking on grounds. Talk-in: 146.08/.68 or 52. Contact *Irene N8HBT, (616) 539-8986* or *Clark KA8TIL (616) 582-6455.*

SWANZEY NH The OSO Wireless Assoc. and the MRHS Band will co-sponsor an outdoor Ham Radio and Electronic Fleamarket at the Monadnock Regional High School from 8 AM-4 PM. Set up at 7 AM. Donations $1 buyers, $4 sellers. VE Exams at 10 AM. Talk-in on 147.375+. Keene Machine, and 146.52 simplex. Contact *John Goodwin N1BAP, RFD1 Box 408C, Keene NH 03431. (603) 352-9153.*

ESSEX JUNCTION VT The Burlington ARC will sponsor a Hamfest at the Champlain Valley Fairgrounds from 8 AM-5 PM. Admission $4. Tables $5 on a first come basis. VE Exams at 2 PM. Talk-in: 146.94/-600 or 146.61/-600. For info: *Tom Taylor N1EXY, (802) 893-4834* or *Joe Tymecki N1DMP, (802) 893-6458.*

AUG 11-12

AMARILLO TX The Panhandle ARC will hold 16th Annual Golden Spread Hamfest which will be held at the Amarillo Civic Center Exhibit Hall in association with the Amarillo Chamber of Commerce from 9 AM-4 PM both days. Pre-registration $6, $7 at the door. Extra chances $2. Tables $5. Talk-in: 146.67 W5WX repeater. Contact *Golden Spread Hamfest, PO Box 1524, Amarillo TX 79105-1524.*

AUG 12

VALPARAISO IN The Porter County ARC will hold its 9th annual Hamfest at the Porter County Fair Grounds starting at 7 AM. Adults $5, under 12 free. Table, chairs and electricity available indoors only. Overnight camping. Talk-in: 146.775/.6 or 52. Contact *Carl KA9TAD, (219) 759-4224* or send SASE to *PCARC, PO Box 1782, Valparaiso IN 46384.*

WARRINGTON PA The Mid-Atlantic ARC's Hamfest '90 will be at the Bucks County Drive-In Theater, on US 611. Buyers admitted at 8 AM, tailgate set up 7 AM. General admission $3. Tailgate space $2. Talk-in 147.06/R and 146.52 simplex. For info call *Al Maslin W3DZI, (215) 446-4936.*

GEORGETOWN KY The ARRL Central Kentucky Hamfest, sponsored by the Bluegrass ARS, Inc., will be held from 8 AM-4 PM at the Scott County High School. Outside flea market space free with paid admission for each person over 12 years of age. Tickets $5 in advance, $6 at the gate. Commercial vendors' tables are $12 each if prepaid before August 1, $15 each after August 1. For info or tickets send SASE to *Bill DeVore N4DIT, 112 Brigadoon Parkway, Lexington KY 40517,* or call evenings *(606) 273-8345.*

ST. CLOUD MN The St. Cloud ARC Hamfest will be held at the Whitney Senior Center. Tickets $3. Extra ticket $2. Talk-in: 34/94 primary, 615/015 secondary. Contact *SCARC, Box 141, St. Cloud MN 56302.*

GEORGETOWN KY The Central Kentucky ARRL Hamfest, sponsored by the Bluegrass ARS, Inc., will be at the Scott County High School from 8 AM-4 PM. Advance tickets $5, $6 at the gate. Commercial exhibits in air conditioned facilities. Outside flea market space fee with paid admission for each person manning the display. For info or tickets, SASE to *Bill DeVore N4DIT, 112 Brigadoon Parkway, Lexington KY 40517.*

AUG 13

BOULDER CO The Boulder VE Team will be testing at the American Legion beginning at 7 PM. For info and to pre-register, call *Barbara McClune N0BWS, (303) 530-1872.*

AUG 17

VERONA NY The Madison-Oneida ARC holds VE Exams the third Friday of every month at the Madison-Oneida BOCES, beginning at 7 PM. Talk-in on 145.37. Contact *Leonard Popyack WF2V, (315) 853-8974,* or *radio 146.79, 145.37, WF2V @ WA2TVE,* or *POPYACK @ TOPS20 RADC AF MIL.*

AUG 19

GEORGETOWN DE The Delmarva Hamfest will be held at the Delaware Tech. Comm Coll. from 8 AM to 4 PM. Inside tables $5. Tailgate $3. Talk-in: 147.075 and 224.84. For table reservations and info write: *Delmarva Hamfest, Route 2 Box 244G, Georgetown DE 19947.*

CAMBRIDGE MA The MIT Electronics Research Soc and the MIT Radio Soc will hold a Tailgate Electronics/Computer/Amateur Radio Flea Market form 9 AM-2 PM at Albany and Main Streets. Free off-street parking. Covered tailgate area available for all sellers, rain or shine. Admission $1.50. Sellers $5 in advance, $8 per space at the gate. Includes 1 admission. Set up at 7 AM. Contact *(617) 253-3776.* Mail advance reservations before the 5th to *W1GSL, PO Box 82 MIT BR, Cambridge MA 02139.*

AUG 25

TOPEKA KS The Washburn RC (Washburn Univ.) will sponsor 'FEST 1990 at the Washburn Univ. in Whiting Fieldhouse from 10 AM-3 PM. Set up at 9 AM. Admission $3 advance, $4 at the door. Swap tables $5 in advance, $7 at the door. Children under 10 free if with an adult. Talk-in 146.955-. Contact *Washburn Radio Club c/o Rob Nall WV0S, 2612 SW Arrowhead Rd., Topeka KS 66614.* Please include an SASE. Make checks payable to Washburn Univ.

ITHACA NY The Tompkins County ARC will sponsor the Finger Lakes Hamfest at the New York State Armory. Handicapped accessible. Tickets $3 in advance, $4 at the gate. Tailgate $2. Indoor space call for price. Under 18 free. Daycare available ages 2 up. For tickets or table info send SASE to: *T.C.A.R.C., PO Box 4144, Ithaca NY 14852-4144* or call *Larry King N2GFW at (607) 347-4313.*

AUG 25-26

DAYTON OH The Dayton Microcomputer Asso., Inc. will sponsor Computerfest '90 at the Hara Conference & Exhibition Center. Free parking. Admission is $3 each day. Children under 12 free when accompanied by an adult. For info call *(513) 263-FEST.* For updates call our BBS at *(513) 293-1754, 300/1200/2400, 8, 1, none.*

MARYSVILLE OH The Union County ARC will sponsor the 15th annual Marysville Hamfest at the Fairgrounds Saturday evening and Sunday. Free entertainment on Saturday evening. Free overnight camping. Admission is $3 advance or $4 at the gate. For info contact *Gene Kirby W8BJN, 13613 US 36, Marysville OH 43040. (513) 644-0468.*

AUG 26

MULLICA HILL NJ The Gloucester County ARC will sponsor a Hamfest at the Gloucester County 4-H Fairgrounds from 8 AM-4 PM. Set up at 6 AM. Admission $3.50 advance, $4 at the gate. Tailgate $6 with electricity, $5 without. Ticket needed with tailgate space. VE Exams 9 AM. Talk-in: 147.18/.78, 223.06, 224.66 repeater, 146.52 simplex starting at 6 AM. Send SASE and check to *GCARC Hamfest, PO Box 370, Pitman NJ 08071.* For info call *KE2NY, (609) 933-0213* or club phone *(609) 478-4738* and leave message.

LEBANON TN The Lebanon Hamfest, sponsored by the Short Mountain Repeater Club, will be at the Cedars of Lebanon State Park, US Highway 231, from 7 AM-3 PM. Outdoor facilities only. Exhibitors bring your own tables. Space available on a first come basis. Talk-in: 146.31/.91. Contact *Mary Alice Fanning KA4GSB, 4936 Danby Dr., Nashville TN 37211. (615) 832-3215.*

SPECIAL EVENT STATIONS

JUL 20-AUG 5

SEATTLE WA The Fort Lewis Amateur Radio Activity, W2USA, will be the official station for the Goodwill Games. Operation will be on the top 15 kHz of the General portion of the 80, 40, 20, 15, and 18 meter bands. 10 meter operation will be in the Novice/Tech portion of the band. For a QSL send a #10 SASE to: *Commander, I Corps and Fort Lewis, AFZH-PAM-H, Ft. Lewis WA 98433-5000.*

AUG 1-6

SAN BENITO TX The San Benito ARC will operate WA2VJL to celebrate the 2nd annual Dog Days of Summer Exchange local weather conditions and general weather facts of your QTH. Frequencies: 21.350, 28.325 SSB; 14.030 CW (CQ DOG) with operation from 1900UTC-0300UTC. For unfolded certificate send 9½ x 11 size SASE and QSL card to: *San Benito ARC, ARRL #2247 SSC, Attn. Brenda V. Ryan-QSL Mgr., PO Box 1382, San Benito TX 78586.*

AUG 3-5

WIESBADEN WEST GERMANY The Wiesbaden ARC will sponsor DA1WA on the 1st annual DX-pedition to the Castle Frankenstein from Friday 2000UTC-1200UTC Sunday. Frequencies 10-80m SSB and CW, using 100 watts and wire antennas. A special QSL card is planned. *QSL via the bureau or direct to DJ0PU.*

AUG 4

MIAMI FL The Active Duty Coast Guard and other guest operators will operate AB4MT from the U.S. Coast Guard Communication Station to celebrate the 200th Anniversary of the U.S. Coast Guard from 0000Z-2400Z. Frequencies: .060 KHz on 7, 14, 21, and 28 MHz CW. 7260, 14260, 21350, 28450 KHz SSB. A Special Edition "Collectors Item" QSL card will be issued for all 2-way contacts, and include a pamphlet of interesting CG info. QSL to *USCG Communication Station Miami FL—NMA, 16001 SW 117th Ave., Miami FL 33177-1699,* or via AB4MT CBA.

AUG 4-5

TITUSVILLE PA The Oil Creek Valley Radio Soc. will operate N3GBH to commemorate the fifth year of operation of the Oil Creek & Titusville Railroad, onsite at the historic Perry Street railroad station Saturday from 1300UTC-1900 UTC Sunday. Frequencies: CW: Novice portion of 80, 40 and 15 meters. SSB: Novice portion of 10 and General portion of 15, 20, 40 and 80 meters. For special photo OSL, cancelled from the only operating railway post office car in the country, send OSL and #10 SASE to *Bill Lyons, Sr. N3GBH, 427 South Drake St., Titusville PA 16354.*

BARNEGAT LIGHT NJ The Old Barney ARC will operate W2OB to commemorate National Lighthouse Day. Frequencies: CW: 3.540, 7.040, 14.040, 21.040, 28.040; SSB: 3.900, 7.275, 14.290, 21.390, 28.390. FM: 146.835 rpt, 146.52. For special QSL, send SASE to *Joseph Fleishinger Sr. NU2F, 75 Joshua Dr., Manahawkin NJ 08050.*

BENTON KY The Marshall County ARA will operate a Special Event Station to celebrate the Steam and Gas Show at Forgotten Past Amusement Park. Frequencies: 20 kHz above the lower phone portion of the General band edge and 28.367+ for ORM, on the Novice portion. For certificate send SASE to: *MCARA, PO Box 534, Benton KY 42025.*

AUG 5

FISHERS ISLAND SOUND NY Tri-City ARC will mount its 6th annual DXpedition to Flat Hammock Island and will operate KA1BB from 1300Z-2000Z. Frequencies: Lower 20 kHz of General class phone and CW bands—10, 15, 20 and 40 meters, the center of 10 M Novice band, and the 2 M SSB band. QSL with letter size SASE via *Tri-City ARC, Box 686, Groton CT 06340.*

AUG 6-11

CUYAHOGA FALLS OH The Cuyahoga Falls ARC will sponsor AA8AA for the 53rd running of the All-American Soap Box Derby, Monday-Friday from 2200Z-0300Z. Saturday from 1100Z-2000Z. Frequencies: 3.860, 14.240, 28.420. For certificate send a large SASE, by 20 Sept 1990, to: *CFARC, Attn. Mark McMahon KE8XO, Box 614, Cuyahoga Falls OH 44222.*

AUG 15-17

BRIDGEWATER NJ The Somerset County Office of Emergency Management will operate WC2ADK Aug. 15-17, from 1400Z-0100Z each day, to promote Amateur Radio, R.A.C.E.S. and Public Service at the annual 4-H Fair. Frequencies: Lower 25 kHz of General 80-10 meters and 10 M Novice; visitors on 145.32 simplex. Send QSL and SASE to *Somerset County OEM/4H, PO Box 3000, Somerville NJ 08876.*

AUG 18-19

HAGERSTOWN MD The Antietam Radio Assoc will sponsor the all-new Maryland/DC QSO Party Aug 18th from 1600Z–2359Z Aug. 19th. Logs should be mailed to the contest chairman by Sept 10, 1990. For info contact *WA3EOP, Contest Chairman, Antietam Radio Association, PO Box 52, Hagerstown MD 21741*. Mail logs to *Antietam Radio Assoc., PO Box 52, Hagerstown MD 21741*.

AUG 18-19

ENGLEWOOD NJ The Englewood ARA, Inc invites all amateurs the world over to take part in the 31st annual New Jersey QSO Party from 2000UTC Aug 18th–0700UTC Aug 19 and from 1300UTC Aug 19–0200UTC Aug 20. Please send all inquiries to: *Englewood ARA, Inc., PO Box 528, Englewood NJ 07631-0528*.

AUG 19-26

DETROIT MI The Jewish Community Center Radio Club will operate Station K8PBQ during the 1990 North American Maccabi Youth Games from 1400UTC–0100UTC. Frequencies CW - 45 kHz from the bottom end of all bands. Novices 3725, 7125 & 21.125 MHz. Phone 3910, 7280, 14.335, 21.380 & 28.580 MHz. Special QSLs and certificates. Certificates for contacts on both CW and phone. Send regular SASE for QSL or 9" x 12" SASE for certificate to: *JCCRC—K8PBQ, 6600 West Maple Rd., West Bloomfield MI 48322*.

AUG 25

WICHITA FALLS TX The Wichita County ARES HF Group will operate WB5PHM from 0700Z–2300Z at the Memorial Stadium, site of the start/finish line for the Hotter-N-Hell-Hundred bicycle ride/race. Operation will be on the General 40 and 80 meter phone bands and Novice thru General 10 meters. For certificate send QSO number and 9" x 12" SASE to *Herb Sleeper WB5PHM, 4705 James Ct, Wichita Falls TX 76308*.

AUG 26

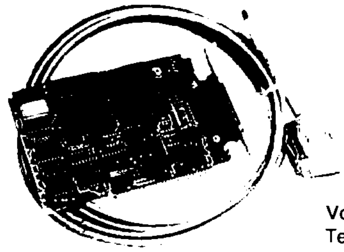
BEDFORD UNITED KINGDOM The Bedford and District ARC in England will operate Station GB0JDC at the Jaguar Drivers Club, Old Warden Airfield. It is intended to operate on 2 M, 6 M and as many of the HF bands as possible. Contact *L R Smith G1ZOJ, 1 Perring Close, Sharnbrook, Bedford UK*.

Number 20 on your Feedback card

73 Review

by Dick Goodman WA3USG

The Kansas City Tracker



L.L. Grace, Inc.
41 Acadia Drive
Voorhees NJ 08043
Tel. (609) 751-1018
Price Class: $189.

Let the computer do the work while you do the operating.

About two years ago, I became interested in space communications, and in working OSCAR 13 in particular. I already had most of the necessary equipment, including an old ICOM IC-211 2 meter all-mode rig and a Microwave Modules 432 MHZ transverter. All I lacked were the uplink and downlink antennas. I considered building these but finally opted to purchase Hy-Gain's OSCAR array. Both the 2 meter and 70cm antennas were well-built and came highly recommended. Needing something to drive these in Az-El, I purchased an Alliance HD-73 rotor for azimuth and a used Kenpro G-500 elevation rotor at a hamfest.

This kept me happy for about 2 years. I have made approximately 250 QSOs through both OSCARs 10 and 13, and my simple equipment performed quite well! These satellites are in highly elliptical orbits; once you point your antennas at them, sometimes you don't have to make adjustments for hours.

Then came the Microsats! These little birds are in circular orbits only a few hundred miles up. A complete pass takes a maximum of twenty minutes, compared to nine or 10 hours for the OSCAR 10 and 13. Antenna pointing requirements for these satellites are much more demanding than for the Phase III birds.

Several articles on receiving techniques recommended omni-directional antennas, such as the J-Pole, dipoles, and even verticals. I tried a couple of configurations, and I was able to receive acceptable signal levels, but there was a lot of QSB. Using my IBM clone and Instant Track software, I could manually keep my OSCAR array pointed at the Microsats and receive signals on the order of 10 to 60 dB over S-9. Unfortunately, keeping the antennas pointed was a full-time job during the pass, and left little time for operating. If only there were a way for the computer to actually control the antennas!

The KCT Package

Well, there is! L.L. Grace, Inc., a small company in Voorhees, New Jersey, manufactures a product called the "Kansas City Tracker."

The Kansas City Tracker, or KCT, is a complete system for pointing your antenna array (both in azimuth and elevation) at any body orbiting the Earth, such as satellites, the space shuttle, and even the moon. It will track your antennas for the entire duration of the pass with an accuracy of ±5 degrees.

The system consists of an 8-bit card that plugs into an IBM clone (mine is a 12 MHz 80286 machine), installation and calibration software, a software driver for the three popular satellite tracking programs (QuikTrak, GRAFTRAK, and Instant Track), and an extremely well-written installation and user's manual. I received my Kansas City Tracker by UPS about a week after I placed the order.

KCT Options

There are two options that you may wish to consider before placing your order. The first is the Kansas City Tuner, which will automatically tune your rig to compensate for Doppler shift during a satellite pass. This $79 option will compensate for Doppler with rigs that have a computer interface or "mike click" tuning (e.g., the TS-711/811). You may think you don't need this now, but IT CANNOT BE INSTALLED LATER. You may buy either of two boards, one with the option and one without. I ordered the board with the tuner, but I haven't used this option yet.

The second option, which you will need if you're using any rotor other than the Yaesu/Kenpro 5400/5600, is the Rotor Interface Option for $30. It consists of 300 mA open collector relay drivers for using the KCT with virtually any antenna rotor that will return an analog voltage level proportional to the rotor position.

The cost of both options plus the basic package is about $305, including shipping.

Installing Relays

The first thing I did upon receiving my KCT was to modify the rotor control boxes for my HD-73 and G-500 elevation rotor. Both control boxes need to have relays, which you can find at Radio Shack. Two relays need to be installed in your azimuth rotor box with the normally open contacts in parallel with the left and right actuator switch contacts. The KCT will actuate these relays to drive the antennas left or right, respectively (and you'll still have complete manual control of your antennas).

The voltage from the position-sensing pot must also be brought out to the KCT through an adjustable voltage divider built from a couple of Radio Shack components. These are installed in the rotor control boxes (this modification is detailed very clearly in the KCT manual). The HD-73 needed some minor changes for these modifications, but they were also covered completely in the manual.

The G-500 elevation rotor control box only needed the relays installed and the position voltage brought out via the divider. No other modifications were necessary to this control box. Total time to modify both control boxes was about one hour. It took another hour to make the cables that go from the rotor control boxes to the connector that plugs into the KCT board (a standard DB-25 supplied with KCT).

Installing the Interface Card

This card occupies four consecutive addresses, starting at the address specified on the card's DIP switches. Mine worked fine with the default address 3E0. If you have an address conflict, you can change to the I/O address of this device. You may also choose the interrupt vector that the KCT uses. The default worked fine with mine (incidentally, my computer is filled with option cards and I experienced no conflicts with either addressing or interrupts). You may change the interrupt level at anytime via the keyboard.

The card may now be installed in any slot in the computer. The installation and calibration software should now be run. This is also clearly documented in the KCT manual, and easily viewed on screen, menu-driven from the computer.

During this process, you will have to adjust the voltage dividers that you installed in the rotor control boxes, so it is best if you leave them accessible until this step is complete. This procedure will tailor the KCT system to your rotor configuration. You can specify what the maximum allowable elevation for your antenna will be.

The KCT system will also "learn" where your stops are and will avoid driving your rotor into them. Once the installation program is complete, you may practice driving the antennas around with the Status Pop-Up program. This is a TSR (Terminate-and-Stay-Resident) program that may be called from within any other nongraphic application by simply pressing ALT and O. A window will "Pop Up," displaying current antenna positions, and allow you to command the antennas in both azimuth and elevation.

Satellite Tracking Software

Also supplied with the KCT package is the software driver for AMSAT's QuikTrak and the other two satellite tracking programs. The programs themselves are not supplied with the

KCT, but you may order them from the AMSAT Software Exchange, PO Box 27, Washington DC 20044. You may also order QuikTrak from L.L. Grace for $80. In order for the KCT to track satellites, one of these programs is necessary. Operating instructions for QuikTrak are included in the KCT manual.

I use Instant Track, which the KCT manual doesn't mention, but the Instant Track manual provides detailed instructions on how to get the KCT operating with it. It took me all of 10 minutes from the time I had the installation and calibration of the KCT complete, to get it working flawlessly with Instant Track!

I track the satellites exactly the same way that I did before I got the KCT. I use Instant Track to see when the birds are coming over the horizon. When the computer indicates that the satellite is up, I simply press "R" on the keyboard and the KCT takes over. After you get the KCT tracking, you can leave the satellite program and use the computer for anything else you want. The KCT driver and tracking software will run in the background and keep both azimuth and elevation antennas right on target for the whole pass. For the Microsats, I load my packet program and QSO via LUSAT or PACSAT while my computer and KCT do their thing.

Earth-Moon-Earth Applications

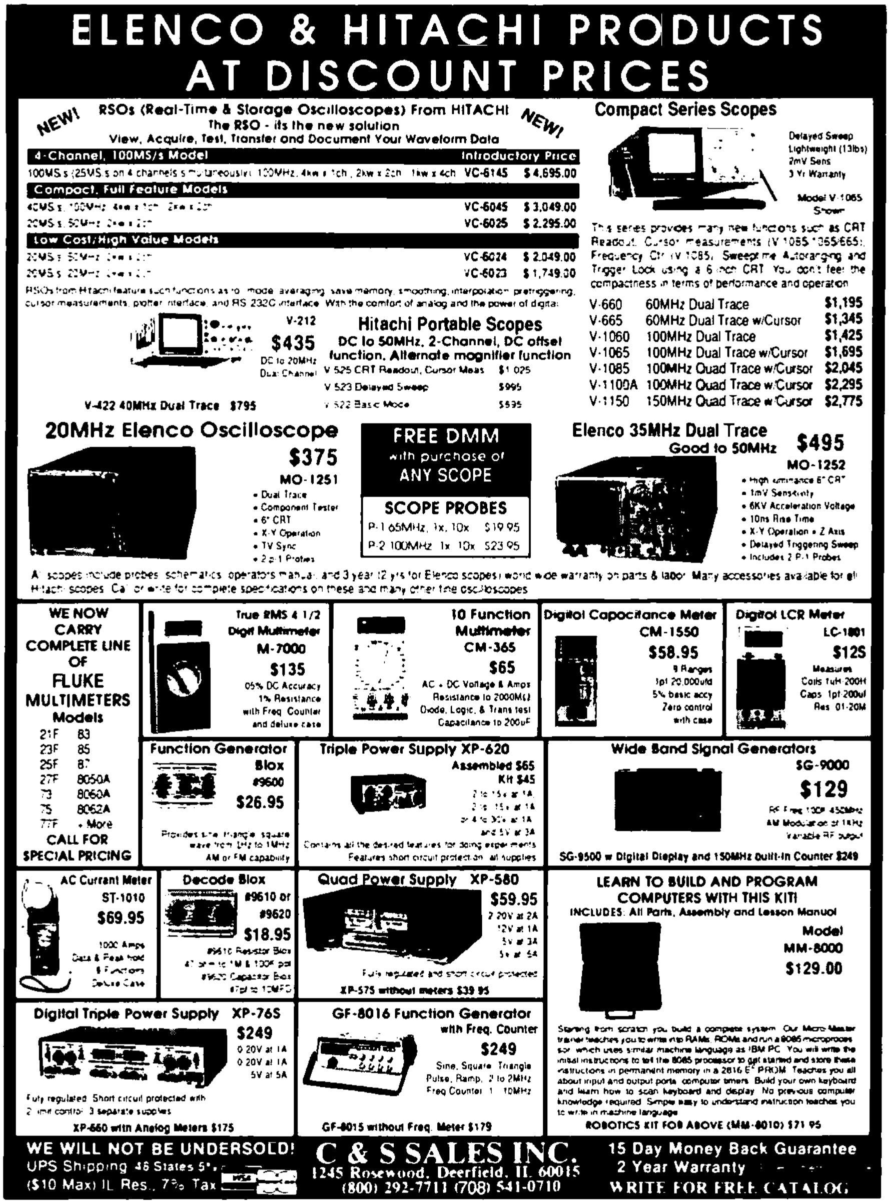
As well as tracking satellites, the KCT used with Instant Track will keep your antennas pointed at the moon for EME applications. Also supplied with the KCT is an antenna pointing program that will allow keyboard control of your array by simply entering the callsign of the station with whom you want to communicate.

The KCT software will announce, automatically or on request, antenna headings and any KCT error conditions (such as a stalled rotor) in Morse code. Speed and spacing are adjustable. This feature would be excellent for blind amateurs.

Finally, one of the programs included with the KCT will drive your antennas to a specific heading, wait a user-selectable length of time, then drive to another heading. This may be repeated as often as desired, with an unlimited number of combinations. As suggested in the KCT manual, this would be excellent for unattended forwarding of packets to stations too distant to connect with via omni-directional antennas. My hat is off to L.L. Grace. They have created a super, high tech, extremely reliable product!

One night while I was on OSCAR 13, Sandy N3ECF, my XYL, needed to access the computer network where she works via modem. I ensured that the KCT was tracking AO-13, exited the Instant Track program, and loaded the telecommunications software. While I made contacts for two hours, she happily ignored me and logged into her network. Meanwhile the computer kept my antennas pointed at a speck in the sky 36,000 km away. Tell this to a ham back in the 1950s. . . we've come a long way. ■

You may contact Dick Goodman WA3USG at 199 Maple Lane, Mechanicsburg PA 17055.



LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Avenue
Saugus CA 91350

No-Code: Making it Work

As I think I made clear last month, I am among those who feel that creating a code-free entry level license class is essential to the future viability of the nation's scientific and technologic base and also to the United States Amateur Radio Service.

Since the early 1980s, I've been convinced that an easy-to-obtain ham ticket with fairly broad operating privileges is the singular way to attract youngsters to the hobby and then on to technological careers. And that is why I am so disappointed, if not openly outraged, with P.R. Docket 90-55. It simply takes away one artificial barrier—the Morse code—and replaces it with another—an additional 30 questions on top of those already needed to get a Novice ticket. I personally prefer an approach that would remove both the CW requirement and 10 meter SSB privileges from the current Novice ticket.

The FCC believes that no license holder should lose any operating privileges he now has. Current Novices would retain their 10 meter voice privileges. New codeless Novices would be permitted some Novice CW privileges on the high frequency bands for on-the-air code practice.

As in other nations who permit their no-code hams to operate HF—whether CW and voice or only CW—another regulatory stipulation would permit United States no-code hams, operating CW on HF, to make contacts with only the domestic U.S. and possibly U.S. possessions. This would be an "everybody wins" situation for any who support code-free licensing. Only those diametrically opposed to any form of no-code can really find fault with it.

My proposal would also carry another requirement: That testing for the Novice class license be brought under the auspices of the VEC testing system. The commission would not have to fear that any Novice tickets were being obtained surreptitiously.

But, as I noted last month, Public Law 259, which permitted the creation of the VE testing system in the first place, carries the stipulation that the Novice class ticket would never carry a charge for testing. It's too bad that its sponsor, Senator Barry Goldwater K7UGA, didn't forsee the semantics game the FCC staff would play to try to get around this. It's like saying that changing the name of the entry level license from Novice to Communicator changes everything and makes it all right for the FCC to violate federal law. This is a case where the FCC could probably be hauled into court and would probably lose, but I think that there is enough ill will between those who govern and the rest of us who must serve. So I offer the following alternative.

I will boldly suggest that the FCC simply direct all VECs and VE teams to give Novice tests at no cost to the applicant! Call it a cost of being in the VEC business if you want. This proviso might make some VECs unhappy, but others already offer no-cost service. Among them are the PHD ARC group in Missouri, and most of the individual teams in the De Vry program.

Getting congressional action might take longer than some might want. Also, there is no guarantee that such legislation would not get attached as a rider to some unrelated bill and wind up as part of a presidential veto. No, my way might not prove popular, but it is a logical way to appease the FCC's demand for better test security. It meets yet another FCC criteria—that the implementation of no-code cannot cost them anything in the way of financial or manpower resources. My plan won't. In fact, nothing at all changes for the FCC.

I give the FCC credit for fielding the no-code issue once again. It has always been a can of worms, and I can feel for people in the commission like Ralph Haller W4RH and Johnny Johnston W3BE, who are again the targets of much criticism from many in the nation's amateur community. Some of the criticism is without foundation, but some of it is justified. To paraphrase an old political adage, you gain little by taking a donkey, painting it gray, and calling it an elephant. If it brays like a donkey and kicks like a donkey, it's still a donkey. The Communicator ticket, for all intents and purposes, is like a Novice ticket with a Communicator-colored coat of paint.

This being the case, I contend that the Communicator be afforded the same protection under Public Law 259 as the Novice. I ask the FCC to think about what they would have done if the law simply stated that the "entry level" test, rather than Novice test, be free?

Deja Vu Department

About a decade ago, a Los Angeles area amateur named Richard Burton was arrested and tried for operating a radio transmitter without a license. I knew Richard from the old Palisades Amateur Radio Club of Culver City. To his credit, he was among the most amiable people one could run into at a P.A.R.C meeting, or on the club's repeater in the early to mid 1970s.

For years, Burton had held the callsign WB6JAC. How he came to have his ticket pulled by the FCC is a lengthly story; suffice it to say that Burton didn't go off the air when ordered to. He was arrested, charged with unlicensed operation, tried, and found guilty. Burton eventually spent seven months in a federal prison, followed by five years of probation during which he was ordered by the court to keep away from any and all radio transmitters.

In November 1989 Burton guested on the highly controversial Tom Leykis Radio Talk Show on KFI-AM in Los Angeles. Leykis, whose on-the-air activities have been cause for FCC action against KFI, brought Burton onto the show because of similar troubles he was having with the government, according to the program's producer, Alan Eisenson. During the hour-long appearance, Burton (who reportedly had been granted permission by the parole board to appear) explained his side of the story and sparred with callers. Leykis asked him if he intended to try to get his amateur license back, to which he replied, "Well, if Big Brother [the FCC] will let me. My five years of probation is nearly up and we'll see."

After his probation ended, Burton did attempt to obtain a new amateur ticket. According to Fred Maia W5YI, he was tested under the W5YI-VEC program and passed. The papers were forwarded to the FCC, but it appears that they were intercepted. At this writing, it is unclear if Burton was denied a license based on his prior record or if the matter was still under advisement at the time of Burton's latest arrest.

It came as a surprise to me to learn that the same Richard Burton has been arrested once again for allegedly operating a radio transmitter without a license. Burton's arrest came on May 17 following what has been described as an intensive investigation by Los Angeles area FCC engineers acting on numerous complaints coming from the amateur community. Two weeks before his arrest, a search warrant was served at Burton's residence while he was at work. The FCC engineers and U.S. marshalls gained entry to his apartment where they seized about $1,000 worth of amateur radio gear.

At his arraignment on May 18, the former radio amateur was charged with three felony counts of violating sections 301 and 501 of the U.S. Code. In a surprise move, government prosecutors requested that Burton be held without bail because during the search of his premises after his arrest, they claimed that a target was found with a photo of Judge Real pasted to it in the bull's-eye. The presiding magistrate denied the motion, setting bond at $10,000. Burton was remanded back to custody awaiting posting of bail. A not guilty plea on all counts was entered on Monday May 21 in Los Angeles Federal Court.

But it does not end there. The following day, Burton was again denied bail and ordered to stand for a psychological examination after testimony by Los Angeles attorney Joseph Merdler N6AHU that he and others heard someone alleged to be Richard Burton on the 147.435 repeater reading names of people on a so-called "kill list." The names on the list are supposed to include FCC F.O.B. Engineer-In-Charge Lawrence D. Guy, Judge Real, Merdler, and others.

And there is still more. A week later federal court judge Robert Takasugi apologized to the former ham for extending his incarceration and then set him free on his own recognizance after the court-ordered psychiatric examination proved that Burton posed no threat to any member of society. When the results of that examination were known to the court, Burton's attorney requested that the $10,000 bail be reduced. Judge Tagasuki went one step further. He apologized to Burton on behalf of the court for the additional week of incarceration. He then set him free on his own signature. Burton's trial is scheduled to begin in early July. It may be concluded by the time you read this. If found guilty on all charges, the former ham could face a hefty fine and up to six years in a federal prison.

Burton Isn't Alone

Richard Burton is by no means the only individual feeling Uncle Sam's regulatory sting. The commission, with the concurrence of the Department of Justice, appears to have embarked on a new wave of enforcement in all services, especially those in the category of "personal communications." Many fines are being issued, and in some cases charges are being filed.

In a case similar to Burton's, the Department of Justice is proceeding with civil action against Dwayne Mayo of Jamaica Queens, New York. Mayo faces civil charges stemming from his refusal to stop using his CB radio after being issued a cease and desist order by the FCC. on April 24, commission engineers and U.S. marshals shut down Mayo's operation because he was causing TVI, had failed to pay a $1500 fine and not stopped operating. A search of Mayo's residence revealed 27 pieces of radio equipment, including five linear amplifiers. At least one of these was capable of running 2000 watts of output.

Playboy Jammer

Then there is the alleged "Playboy Jammer." Thomas M. Haynie of Virginia Beach, Virginia, has been indicted by a grand jury in the Eastern District of Virginia, charged with three counts of intentional interference and three counts of unlicensed operation of a satellite uplink. The indictment alleges that on September 6, 1987, Haynie was uplink operator on duty at the Christian Broadcasting Network facility in Virginia Beach. On three separate occasions an electronically generated video text message completely captured programming carried on two satellite transponders—one each on *GE Satcom IV* and *GTE Spacenet I*. The government intends to try to prove that it was Haynie's actions that jammed feeds of the Playboy channel. If convicted, Haynie also faces the possibility of prison and heavy fines. (*FCC News*, 27 April 1990).

Non-Maritime Fine

Acting on information from local hams, the FCC's Seattle Office identified and fined George M. Muchin of Redmond, Washington, for unauthorized and unlicensed operation of a marine radio transmitter. The FCC alleges that Muchin, who owns Redmond Plumbing, was being assessed a $1500 forfeiture for using 156.575 MHz for conducting non-marine business. Mobile direction finding equipment was used to trace the transmissions first to a worker's truck and then to a private residence. (FCC Public Notice 30 April 1990.)

Michigan Scanner Law Favors Hams

We will close this month with some good news coming from Michigan by way of Chicago, Illinois, from my friend and associate Hap Holly KC9RP. He reports that finally, on May 23, after three years of hard work by the Michigan amateur radio community, Michigan Governor James Blanchard has signed a bill into law that permits hams holding a Technician or higher class license to operate in their cars hand-held or mobile equipment capable of scanning law enforcement frequencies. The new legislation amends a previous law that permitted such activity only by hams holding General/Conditional Class or higher licenses.

The new law still excludes Novice Class operators. Jim Brooker NI8E, a witness to the bill's signing, speculates that Novices were excluded because the majority of VHF emergency communications in Michigan takes place on 2 meters, a band not open to Novice operation. Therefore, it is not necessary for Novices to carry such gear in their vehicles.

The signing ceremony was aired live over a statewide network that included some twenty amateur repeaters. While the new bill appears to be a step in the right direction, Michigan remains one of four states that have such restrictive laws. The others are Minnesota, Kentucky, and New Jersey.

The ARRL has placed a request before the FCC for the issuance of a "Declaratory Ruling" stating that such laws be preempted by the federal government. Consequently, the FCC has issued PRB-3—known in some quarters as the "Mendelsohn Law," after ARRL Hudson Division Director Steve Mendelsohn WA2DHF who is leading the fight for its adoption and implementation. According to Benn Kobb KC5CW (*Federal Communications TechNews*), possible FCC action regarding PRB-3 in general and scanner laws in particular may take place sometime in 1991. ■

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Alabama Action

If there is one thing that equals the excitement of going on a T-hunt, it's talking about T-hunting with someone who is really enthusiastic about it. I have been in the lucky position of being able to correspond with foxhunters all over the world, but no one has exceeded the zeal of Bill Levey WA4FAT of Birmingham, Alabama.

"It's a hoot," was his immediate reply when I asked him what he thought about his recent RDF adventures. "It really revved my motor."

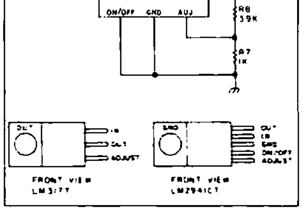
The Birmingham Amateur Radio Club has a monthly 2 meter hunt with boundaries that encompass the entire greater Birmingham area map. That covers parts of three counties, including urban, suburban and rural terrain, plus rolling hills and woods.

The hunts are on Sunday afternoons, and sometimes 40 hams converge at the hilltop starting point. Saturday night hunts didn't work out well, Levey says, especially during college football season. There are two winners possible for each hunt: one for the shortest time, and one for the lowest mileage. The Hunt Committee then determines who hides next time.

"I can't imagine any area in the country being more excited about DFing," Levey enthused. The club has branched out to put on special hunts, such as a recent on-foot outing in Oak Mountain State Park, with three transmitters scattered over a wide area. There is even talk of a regional DF championship now that there is increasing foxhunt activity in nearby Montgomery and Huntsville.

Birmingham hunters use a variety of RDF methods in pursuit of the foxes, including Dopplers and a dual antenna unit of Coast Guard design. Parasitic antennas seem to be the most popular choice at the starting point. Long beams aren't needed because signals are usually quite strong. Two-element quads are popular because they can be stuffed into a car trunk without disassembly before and after the hunt.

For occasions when more gain is needed, a few enterprising hunters use an add-on set of two yagi-type directors that "plug in" to the boom of the 2-element quad. This turns the antenna into a 4-element quagi.



Schematic of modified regulator circuit using LM2941. Note printout differences between LM317 and LM2941.

While many hunters in Birmingham and elsewhere like the antenna fabrication part of RDF as much as the foxhunting part, others would prefer to let someone else handle the building chores. WA4FAT's company (Alabama Amateur Electronics) makes it possible with a line of lightweight quads for 28–450 MHz. I'm experimenting with one of AAE's 2 meter models right now and I'll give you a full report soon in this column.

Unfinished Business

Last month I described how to adapt the Optoelectronics model CCB bug detector for sniffing out the fox at the end of the hunt. I was disappointed that the Optoelectronics board uses the LM317 voltage regulator to obtain the +6.25 volt reference for the display. The LM317 has high offset voltage so it falls out of regulation when the supply battery voltage drops below 7.9 volts, causing a drastic reduction in sensitivity.

One-chip low offset voltage regulators have been around for some time, but most either can't be set to +6.25 volts or don't have enough output current capability. After lots of research, followed by a bit of impassioned pleading with the local sales office, I got a National LM2941CT low offset high current adjustable regulator.

The LM2941 goes onto the CCB board with a couple of minor modifications. First, remove the 240 ohm resistor at R6 and substitute a 3.9k resistor. Next, unbolt and remove the LM317. Looking at Figure 1, you can see that the 2941 has two additional leads, and the INPUT/OUTPUT pins are in different locations. Furthermore, the tab is at ground on the 2941 and connected to OUTPUT on the 317.

Bend the ON/OFF and GROUND pins up out of the way temporarily, then bend the OUTPUT pin under the INPUT pin and solder the ADJUST, INPUT and OUTPUT pins into the proper holes on the board. Make sure the INPUT and OUTPUT pins do not short to each other. Finish off the job by connecting the ON/OFF and GROUND pins to nearby ground foil with a short jumper wire.

Do not bolt the 2941 to the board—that will short the output to ground. Put a piece of electrical tape between the IC and the board to prevent inadvertent contact at the mounting hole. You will get much better battery life with the new regulator because the reference stays solid with battery voltage down to 6.5 volts.

The LM2941CT came out less than a year ago, and it is hard to get. It's carried in the Advanced Computer Products catalog (1310 E. Edinger Avenue, Santa Ana CA 92705). Call ACP at (714) 558-8813 or (800) 366-3227. Cross your fingers because that part sells out quickly.

Hunters' Forum

If you live in a part of the country where there are only a few months of good hunting weather and only a couple of hunts in a year, it may be hard to believe that RDFers could lose track of local hunt happenings. But with over a dozen hunts a month from which to choose year-round, Southern California T-hunters can easily get confused. (Let's see, who's hiding the Path finder hunt this weekend? Ron won last month, didn't he? Or did he win the Rio Hondo hunt?)

To help reduce the confusion and promote competitive foxhunting, Martin Hasa KB6MAH is publishing *T-HUNT FORUM*, a monthly newsletter for Southern California T-hunters. It lists all the upcoming hunts of the month, plus the results of hunts in the past month. Martin welcomes and encourages reader input. His informal, humorous style captures the fun of foxhunting very effectively. Hams may not yet be ready for a national T-hunt newsletter but when they are, I nominate KB6MAH to put it out. Meanwhile, a regular local flyer like Martin's might be just the thing to jump start the interest in your area. Martin won't do subscriptions, but he will mail you some recent issues if you send an SASE to him at 701 West Maxzim Avenue, Fullerton CA 92632. The more postage you put on the envelope, the more issues he will send. I suggest two or three ounces worth. (Southern California hunters must pick up their current issues at the starting point of a hunt.)

Martin is an accomplished photographer, too. You will see his photos in most *T-HUNT FORUM* issues. He has also done darkroom work on many of the pictures you have seen in "Homing In." He loves to experiment with new gimmicks in both photography and T-hunting. Recently, he combined the two when he took pictures of a night hunt using available light and ultra-fast film (see Photo A).

Photo A. KB6MAH caught ye olde columnist (with the sniffer) and expert navigator WA6OPS (dialing the HT) while experimenting with high speed film.

Are You Lost?

For some time now, we have been tantalized by stories of new navigation systems for cars that will be available "real soon now." A computer will keep track of your car's position in real time, and guide you through the city as you search out the hidden transmitter. It sounds like T-hunt heaven. Imagine connecting your antenna indicator and compass to a navigation computer to plot bearings, do triangulations, and figure out the way to get to the T with minimum time or mileage, whichever will win the hunt!

That day may be getting closer. Klynas Engineering of Simi Valley, California, has released "Streets on a Disk," a software package for IBM computers, with maps said to be available for the whole USA. You can even print out customized directions to your destination.

Before you get too excited, look at the price tag: $225 for the software and a basic USA interstate highway map, plus additional bucks for each detailed map. For example, the Orange County, California, map costs $570 by itself. Gosh, some of our hunts include four or more counties!

And the software doesn't talk to your antenna pointer, at least not yet. Then there is the matter of trying to operate an IBM computer in your car without RFI killing the weak signals. Worst of all, navigation software is intended for city use, not those new not-yet-on-the-map housing tracts and out-in-the-sticks canyons and washes. What we need here is "Boonies on a Disk!" But, seriously, I'd like to hear from any T-hunters who have occasion to try out this package, or anything like it. (My trusty old Kaypro won't run it.) If you think it has foxhunting possibilities, we'll put out the word in this column. 73

ASK KABOOM

The Tech Answer Man

Michael J. Geier KB1UM
7 Simpson Ct.
S. Burlington VT 05403

Hints, Kinks and By The Numbers

Recently I've received some letters with good comments and suggestions, and I thought I'd pass a few of them along.

I mentioned in my article, "Cassette Box Special," in the April 1990 issue, that melting seemed to be the only way to make a hole in a cassette box without cracking it. John WRØW suggests using a drill bit with deliberately-dulled outer edges. "That way," he says, "the center cuts and the edge melts." I haven't tried it, but it sounds like a good idea.

W4DZA mentions a problem that may not be one. He says, "If your HF set jumps frequency a few kHz when it is keyed, check the RIT before sending it in for repair." I guess that would be easy to overtook. And there's no question that most electronic items sent in for repair are not actually broken.

Kenneth WA2VWS takes issue with my statement that a 600 ohm mike will not work well into a 50k ohm input. He states, quite correctly, that mike inputs usually are voltage-responding, and do not care about maximum power transfer. That's true, but that's the reason it doesn't work well. A 600 ohm mike will have low voltage at higher current, and the voltage-sensitive 50k ohm input will not be driven nearly as hard as if the proper mike were used. If the speech amp has enough gain, it may be OK, but in my experience, the audio will be weak, with corresponding weak transmit power on SSB.

Several readers have asked about the availability of PC boards for The Banker (also in the April issue) or of finished units. I'm afraid I can't help either way. The Banker is no longer in production, and there aren't any spare boards. It's really a simple project, and a great introduction to home-brewing. So come on, folks, build them! You don't have to use a PC board—perfboard or point-to-point wiring will work fine.

Finally, I'm still getting antenna questions and letters with SASEs. The purpose of this column is to discuss troubleshooting and basic theory, with a slant toward modern solid state gear. I don't do tubes, amps, tuners or antennas. And much as I'd like to, I just can't send personal replies, except on rare occasions. So please, save your stamps. Now, let's get to this month's topic.

Playing the Numbers

If you fix or build anything electronic, you're going to deal with numbers. The field is inherently numeric and, whether you're setting controls, using a scope, or just checking your transmitter output on a wattmeter, you're going to run into big numbers, little numbers, and especially metric numbers. Resistors, capacitors and other components, as well as quantities like amps, volts, ohms, watts and frequencies, are specified using the metric system, and for good reason. Being able to multiply and divide by factors of ten makes everything tremendously easier. Imagine if there were 12 ohms to a foot-ohm and 36 watts to a yard-watt! What a headache.

Luckily, it's easy to learn the metrics for scientific use, because you don't have to *unlearn* anything else first. Here are the metric units commonly used in the electronics game:

Giga (G):	times 1,000,000,000
Mega (M):	times 1,000,000
Kilo (k):	times 1,000
Milli (m):	divided by 1,000
Micro (μ):	divided by 1,000,000
Nano (n):	divided by 1,000,000,000
Pico (p):	divided by 1,000,000,000,000

Wow! Some pretty crazy numbers, huh? Yes, but they are very useful. In order to do any calculation with them, though, you really need to put them into a more easily-manipulated form. As they are, they're just too cumbersome. Enter good ol' scientific notation.

Ten to the What?

You probably remember this from high school. It's just a way of describing the number of zeros attached to a number. For instance, Mega is 10^6. In other words, a 1 with six zeros after it, or 1,000,000. The whole range looks like this:

Giga (G):	times 10^9
Mega (M):	times 10^6
Kilo (k):	times 10^3
Milli (m):	times 10^{-3}
Micro (μ):	times 10^{-6}
Nano (n):	times 10^{-9}
Pico (p):	times 10^{-12}

That looks a lot neater, doesn't it? And it makes it easy to put very big and very small numbers into formulas without juggling unwieldy blobs of zeros around.

Notice that there are no more "divided by's." To make division into multiplication, all you do is put a minus sign next to the exponent. So, 5 divided by 10^3 is the same as 5 times 10^{-3}. Multiplying is easier than dividing any old day, and keeping it all the same avoids confusion. Also, notice that all the powers of 10 (the "exponents") are grouped in three's: 10^{-3}, 10^{-6}, etc. This standardization of groupings makes it easier to mix or operate on the numbers.

For instance, how would you add two capacitors in parallel if they were specified as 1 x 10^{-8} and 5 x 10^{-9} farads? Sounds messy, huh? How about if they were 0.01 microfarad and 0.005 microfarad? That's easy; it would be 0.015 microfarad (0.015 μF). See what I mean?

You'll find this system in virtually all aspects of electronics. If, for instance, you use a milliammeter, you're measuring amps times 10^{-3}. A circuit drawing 700 mA is drawing 0.7 amps. It's as simple as that. And if you use a frequency counter and measure 14.2 megahertz (MHz), that's 14.2 x 10^6 cycles per second.

All this really comes together when you use instruments like scopes and DVMs. I strongly recommend that you get a scientific calculator. They're cheap these days (around $15) and are worth their weight in gold. You may never need all those fancy mathematical operations (doesn't it hurt to know that a $15 box knows more math than we do?), but the ability to calculate using exponents is vital. Most scientifics have an "engineering notation" button, which simply takes answers like 5 x 10^{-2} and converts them to 50 x 10^{-3}, in accordance with the handy groupings described above. Also, some of these machines can do number base calculations and conversions, and these are really useful if you do much computer programming.

If You've Got the Time...

If you've got a scope, its horizontal timebase (sweep speed) is undoubtedly calibrated by time, rather than sweep frequency. Only very old "recurrent sweep" (in other words, non-triggered-sweep) scopes used frequency markings. The time units are far more useful. They specify the length of time it takes the beam to sweep the width of one box on the graticule. So, if you have a waveform which makes a complete cycle in 2.6 boxes, all you have to do is multiply 2.6 by the setting of the sweep knob and you know the time period of each cycle.

But how do you figure the frequency? That's easy: just invert the number by dividing 1 by it. Let's say your waveform completes one cycle in 2.6 boxes with the sweep knob set to 5 microseconds. The total time for one cycle is then 2.6 times 5 x 10^{-6} seconds, or 13 x 10^{-6} seconds (in other words, 13 microseconds). To get the frequency, just divide 1 by 13 x 10^{-6} and you'll get 76.9 x 10^3 or 76.9 kilohertz.

If you have a dual-trace scope, you can measure the time difference between two waveforms as long as their speeds are related to each other. (If they weren't, their time difference would constantly be shifting, just like two watches running at different speeds.) If one wave starts its cycle 2 boxes after the other, then it lags by 2 times 5 x 10^{-6} seconds, or 10 microseconds. (This assumes, of course, that you still have the sweep knob set to 5 microseconds.)

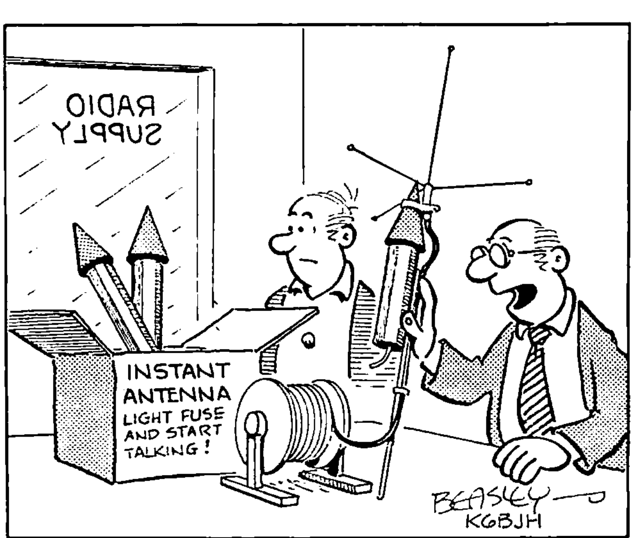
If you'd like to express the time difference as a phase angle, all you do is relate the time to the magic number 360, which is the number of degrees in one cycle, no matter what its actual time period may be. For example, if the first wave has a total time period of 13 microseconds and the second wave lags by 10 microseconds, the second wave is out of phase by: 10 divided by 13, times 360. Thus, it lags by 276.9 degrees. This kind of information can be extremely useful if you're trying to service a frequency synthesizer, ATV video camera, packet modem, etc.

These same kinds of tricks work great with meters, digital or analog. If you've measured 50k ohms, that's 50 x 10^3 ohms. If you've got 0.03 amps, that's 30 x 10^{-3} amps, or 30 milliamps (mA). But why bother to call it 30 x 10^{-3} amps when 30 mA sounds so much better?

It's the Law

When using Ohm's law, or any other formula, always remember to use the exponents. If, for instance, you want to know the current through a 10k ohm resistor with 6 volts applied across it, just divide 6 by 10 x 10^3, and you'll get 0.6 x 10^{-3}, or 0.6 milliamps. That's also 600 microamps (600 μA).

So, get a scientific calculator and experiment! Once you see the relationships of the metric number groupings, you'll find your electronic work much easier. Even if you don't design anything yourself, your enhanced ability to calculate currents and other quantities while troubleshooting will speed you along. Plus, that new scope you got at the hamfest should seem a whole lot clearer. Good luck x 10^{12}!

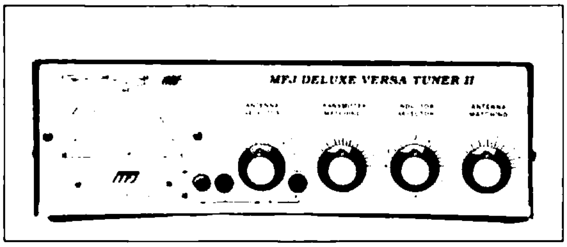


YOU DO HAVE TO KEEP YOUR QSO'S QUITE SHORT

Number 25 on your Feedback card

NEW PRODUCTS

Compiled by Hope Currier

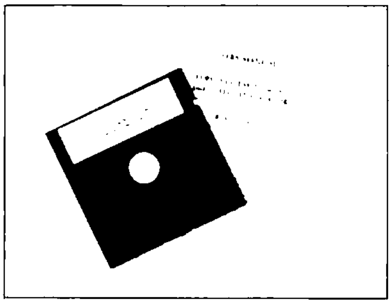


PRODUCT OF THE MONTH

MFJ

The MFJ-948 is a 300 watt antenna tuner that tunes out SWR for maximum power transfer to verticals, dipoles, inverted Vees, beams, quads, mobile whips fed by coax, balanced lines or single wire—virtually any HF antenna. It covers 1.8 to 30 MHz and is made in the U.S.A. This deluxe antenna tuner features MFJ's lighted peak reading cross-needle SWR wattmeter with an ON/OFF switch for the meter lamp. It will show you SWR, forward and reflected power at a single glance. It also reads average power. It reads power on two scales: 30 or 300 watts. Besides the lamp switch, other front panel meter switches let you select PEAK/AVERAGE power and HIGH/LOW power scales. A 6-position antenna switch lets you select two coax lines (direct or through tuner), random wire, balanced line and external dummy load. A 4:1 balun makes it easy to hook up balanced line antennas.

The MFJ-948 is priced at $130. The lamp uses 12 VDC or 110 VAC with MFJ-1312, $13. For more information contact any MFJ dealer or *MFJ Enterprises, Inc., P.O. Box 494, Mississippi State MS 39762. Phone (601) 323-5869 or (800) 647-1800, FAX (601) 323-6551, Telex 53 4590 MFJSTKV.* Or circle Reader Service No. 201.

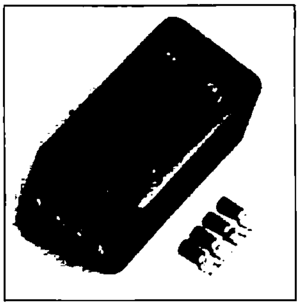


BAYLIN PUBLICATIONS

"TVRO System Analysis and Antenna Aiming Computer Programs for Satellite Technicians" by Greg Grissom, from Baylin Publications, is a software program for IBM and compatible computers. It can be instrumental in TVRO system analysis and antenna aiming. This tool for designing and installing TVROs is tailored for satellite professionals, dealers, and technically-oriented TVRO owners. It can also be used in sales presentations to demonstrate how changing parameters, such as dish size or LNB noise temperature, affect picture quality. The analysis subcomponent, especially useful for predicting performance when viewing signals from a particularly weak satellite, accurately calculates picture quality from footprint maps and system parameters such as LNB noise temperature and antenna diameter. The aiming subcomponent is used to calculate azimuth and elevation angles and the range to all satellites within "view" of a TVRO.

This software is available on 5.25-inch and 3.5-inch floppy disks for $50, plus $2 S & H, from *Baylin Publications, 1905 Mariposa, Boulder CO 80302.* Or circle Reader Service No. 204.

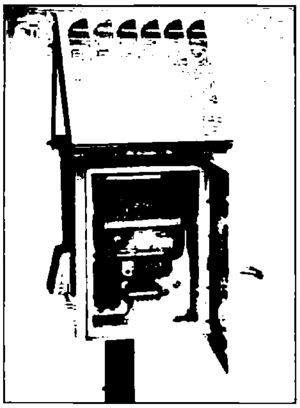
RF TRONICS



RF Tronics, a company that specializes in custom electronic hobby accessories, has solved the memory problem in nickel-cadmium batteries with the CAD-CYCLER. The CAD-CYCLER helps restore a battery to its full amp-hour capacity by properly discharging the pack to a precise, recommended level. Full capacity is usually restored in three charge/discharge cycles. Repeated use of the CAD-CYCLER will help prevent memory from ever forming and will maximize the life span and number of charge/discharge cycles that your batteries were designed to produce. The CAD-CYCLER can be used on any battery as long as the number of cells in the pack match the model number: Models CC-4, CC-5 and CC-8 discharge at 500mA; CC-6 and CC-7 at 600mA.

The special introductory price for all models is $35 each (regular price is $39), plus $2.50 S & H. Contact *RF Tronics, P.O. Box 718, Agawam MA 01001-0718. (413) 786-6162.* Or circle Reader Service No. 202.

HELIOPOWER, INC.



The Solar Power Pack (SPP) from Heliopower, Inc., is a complete, sell-contained DC solar power system available in three standard sizes. It includes all the components of a solar power system: a high-performance photovoltaic (PV) module for efficient collection of solar energy, a charge regulator for precise charging and discharging control, plus a sealed, deep-cycle, low-maintenance storage battery. These components come completely assembled in a weatherproof NEMA 3R enclosure with hardware for various mounting applications.

With its protective enclosure, high-quality system components and reliable Hoxan module, the Solar Power Pack is easy to install and can operate with minimal maintenance for many years. It is especially useful in remote areas, to power pipeline telemetry, irrigation system controls and light duty radio repeaters.

Available load capacities range from 19 to 73 watt-hours per day. Assuming 4.5 peak hours of sun, each can operate up to five days on battery power alone. The SPP-05 (19 daily watt-hour load capacity) is $700, SPP-10 (29 daily watt-hours) is $760, and SPP-20 (73 daily watt-hours) is $920. Load capacity is climate and site specific—Heliopower will help customers choose the correct SSP for each location and application. Contact *Heliopower, One Centennial Plaza 3F, Piscataway NJ 08854. (201) 980-0707.* Or circle Reader Service No. 203.

CYBERRESEARCH

CyberResearch has released a new, enlarged edition of *PC Systems Handbook for Scientists and Engineers*. This new catalog (Volume 7, Number 1, Spring 1990) contains many new products for PC-based data acquisition and instrumentation control. CyberResearch has assembled a large selection of compatible products, saving users the many hours of research required to find products that will work together. Detailed applications diagrams of several data acquisition and control systems provide helpful examples for those who wish to understand PC-based products for laboratory and industrial use. The handbook is filled with detailed Tech Notes which explain complex concepts and new developments in data acquisition equipment. It provides a wealth of technical information and serves as a combination technical reference and catalog.

To request a copy of this catalog contact *CyberResearch, Inc., P.O. Box 9565, New Haven CT 06535. (800) 341-2525.* Or circle Reader Service No. 205.

Dx

Hams Around the World

Bob Winn W5KNE
c/o QRZ DX
PO Box 832205
Richardson TX 75083

Callsigns Galore

A callsign is more than just a method of identifying and recognizing a station on the air. If this weren't the case, there wouldn't be so many vanity or special callsigns in existence.

Given a choice, most amateur radio operators will choose a callsign with a "vanity" suffix, such as the operator's initials or a combination of letters with a special meaning, like CO, DX, CW, YL, OM, etc. There are many examples of callsigns using the operator's initials in the suffix, especially in the U.S., and in DX operations, too: Jim Smith VK9NS as A51JS, T33JS and T31JS, Tom Warren (K3TW) from 5H3TW and others; and Dave O Guthene at 5N8DOG.

We shouldn't forget the callsigns whose letters and digits form words, such as W1ND, WØRE, K1SS and STØRK. Then there are the April Fool callsigns, such as CØAX, FRØZE, SL1M, and so on; these are cute, but bogus.

There is nothing new about this preoccupation with special or unique callsigns. Since the early days of radio, before official callsigns were issued by a government, many operators signed their initials or some special combination of letters. Let's face it, in our hobby we are primarily known by our callsigns, not by our given names.

You shouldn't be surprised to learn that many QSL collectors specialize in collecting prefixes and unique or commemorative callsigns. There's more to DXing than just hunting new countries and collecting 300+ QSL cards. Since the advent of the popular CQ WPX Award, the proliferation of rare or little-used prefixes has been overwhelming, especially during contests. The table shows a sample of some recent special callsigns using unusual prefixes.

Several countries are very liberal when allowing special prefixes. Brazil, Canada and Italy certainly top the list.

Official and Unofficial Callsigns

Under normal conditions, amateur radio callsigns are issued from blocks of callsign prefixes allocated to each country by the International Telecommuncations Union (ITU). However, there are exceptions. Several unused ITU callsign prefix blocks are being used for amateur radio operations without being authorized by the ITU. These prefixes are generally used for DX "countries" whose governments are not recognized, or who are not administered by any government.

Most of the unofficial callsigns come from the block of prefixes beginning with 1. For example: 1AØKM—Sovereign Military Order of Malta; 1S—Spratly Islands; and 1Z—Karen State of Burma. There are others, but these three are best known. The international callsign prefix allocations are listed in the *Amateur Radio Callbook* and *The ARRL DXCC Countries List*.

You'll notice that many countries are authorized callsign prefixes from different blocks, hence their amateur radio operators can be inventive during special occasions and contests.

Romancing the Callsign

Romance? Yes... to many QSL collectors, whether dedicated or casual, the lure of a special callsign is more than they can bear.

What makes a special callsign? Any callsign of unusual form, size, or reason for being is collectable. A group of examples must include the following categories: No digit—6DAPAX (celebrating the Pope's visit to Mexico; a normal 6D callsign would have a digit after the 6D) and RAEM (ship's callsign assigned to Soviet Hero Ernst Krenkel). Short—PJ9A, CI7U, CTØB, LT4F, RI6O, ZX5C, IN1U, etc. Short and sweet—U2Q, M1C, T4A, U9Z. Unusual—TU73, JY1, TYA11, GB1IARU, TGØFRACAP, etc. Commemorative—3F75JC (75th anniversary of Panama independence), 9Y5ØNP (50 years of amateur radio), VR2ØØPI (Pitcairn Island bicentennial) and more. Think of the possibilities... such as a DXCC of 1 by 1 callsigns!

Special Callsigns—Unusual Prefixes

3ZØE	Poland	HU1A	El Salvador
HG1S	Hungary	IL3A	Italy
SN3A	Poland	LT4F	Argentina
4M9X	Venezuela	RX9A	USSR
CQ5T	Portugal	TM2A	France
H73A	Nicaragua	ZX5C	Brazil

Embedded Information

In many callsign systems built-in logic helps identify geographical or political location, separate islands from the mainland, special categories, and so forth. For instance, at one time, all U.S. callsigns whose suffix began with an X were experimental stations. Some examples are W1ØXDA, W2XMN, and WE2XCC. A wealth of information can be learned from callsigns.

The structure of most callsigns uses the digit to identify a geographical or political area within the country. However, there are several countries where this is not true. In Argentina, for example, the digit is meaningless, but the first letter of the suffix identifies the station's location. The letters of the alphabet generally indicate provinces from north to south. The letter Z identifies stations located in the most southerly areas of Argentina—in the Antarctic areas (LU1ZE, LU2ZG, LU5ZR, etc.).

In the British system of callsign allocation the digit in the prefix does not have any geographical significance, but the callsign can often provide a clue about how long the operator has been licensed, or at least when the callsign was first issued (callsigns are not reissued except to family members or some organizations). All **G2, G3, G4, G5, G6** and **G8** callsigns with a two-letter suffix were issued before World War II (1920–1939). G2 callsigns with three-letter suffixes were "artificial antenna" permits (authorized to transmit into a dummy load only) issued in 1939. Since 1946, all new licenses beginning with G3AAA have been issued with a three-letter suffix (G3AAA-G3AZZ in 1946, G3HAA-G3HZZ in 1950 and 1951, G3NAA-G3NZZ in 1958-1960, etc.).

One unique feature of the British system allows British amateurs moving from one British "country" to another to keep the same digit and suffix. They simply change prefixes (G3AAA could sign GW3AAA, GM3AAA, etc.).

There is much more to learn about the romance of callsigns, with many interesting stories attached to them. What is the story of TYA11? Why did Ernst Krenkel sign RAEM (obviously not an amateur radio callsign) on the amateur bands? Old issues of ham magazines, DX bulletins, and DX handbooks tell the stories. It's part of the romance of DXing. If you're interested in learning about the formative years of DXing, an excellent way to begin is by reading *DX IS!* by Charles Allen W5DV and Jim Allen W6OGC. You can purchase a copy for $7.50 postpaid in the U.S. from Charles Allen W5DV, 42 Bob White Lane, New Braunfels TX 78130.

Next month I'll present an assortment of DX tidbits. 73 and DX. 73

Dealer Directory

CALIFORNIA

San Diego

Hard to find parts, surplus electronics, standard line items. Hams, hobbyists, industrial professionals—from nuts & bolts to laser diodes...Electronically speaking, Gateway's got it! M-F 9-5:30 Sat. 9-5. **GATEWAY ELECTRONICS, 9222 Chesapeake Drive, San Diego CA 92123; (619) 279-6802.**

COLORADO

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New Castle

Factory authorized dealer! Yaesu, ICOM, Ten-Tec, KDK, Kenwood, AEA, Kantronics, Santec. Full line of accessories. No sales tax in Delaware. One mile off I-95. **DELAWARE AMATEUR SUPPLY, 71 Meadow Road, New Castle DE 19720; (302) 328-7728.**

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Ross WB7BYZ has the largest stock of amateur gear in the Intermountain West and the best prices. Over 9,000 ham related gear in stock. Call us for "all" your ham needs today. **ROSS DISTRIBUTING Co., 78 S. State, Preston ID 63263; (208) 852-0830.**

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We have it! AEA, ASTRON, BUTTERNUT, CALLBOOK, COMET, DIAMOND, HEATHKIT, HUSTLER, KANTRONICS, LASER COMPUTERS, MFJ, RADIO SHACK, SMILEY ANTENNAS, TEN-TEC, VALOR ANTENNAS & more. Small town service with discount prices. **DANDYS, 120 N. Washington, Wellington, KS. 67152, (316) 326-6314.** Circle Reader Service 263 for more information.

MISSOURI

St. Louis

Hard to find parts, surplus electronics, standard line items. Hams, hobbyists, industrial professionals—from nuts & bolts to laser diodes...Electronically speaking, Gateway's got it! M-F 9-5:30 Sat. 9-5. **GATEWAY ELECTRONICS, 8123 Page Blvd., St. Louis MO 63130; (314) 427-6116.**

NEW HAMPSHIRE

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Serving the ham community with new and used equipment. We stock and service most major lines. AEA, Astron, B&W, Bencher, Cushcraft, Hustler, ICOM, Kenwood, KLM, Larsen, MFJ, Mirage, Vibroplex; books, rotors, cable and connectors. Business hours Mon.-Sat. 10-5, Thursday 10-7. Closed Sun./Holidays. **RIVENDELL ELECTRONICS, 8 Londonderry Road, Derry NH 03038; (603)434-5371.**

NEW YORK

Jamestown

Western New York's finest amateur radio dealer featuring ICOM-Larsen-AEA-Hamtronics-Astron. New and used gear. 6 am to 5:30, Sat. and Sun. by appointment. **VHF COMMUNICATIONS, 280 Tiffany Ave., Jamestown NY 14701, (716) 664-6345.** Circle Reader Service number **129** for more information.

Manhattan

Manhattan's largest and only ham and business Radio Store. Featuring **MOTOROLA, ICOM, KENWOOD, YAESU, AEA, SONY,** BIRD, TEN-TEC, etc. Full stock of radios and accessories. Repair lab on premises. Open 7 days M-F, 9-6:30 pm; Sat & Sun, 10-5 pm. We ship worldwide. **BARRY ELECTRONICS, 512 Broadway, New York NY 10012; (212) 925-7000. FAX (212) 925-7001.**

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Central Ohio's full-line authorized dealer for Kenwood, ICOM, Yaesu, Alinco, Info-Tech, Japan Radio, AEA, Cushcraft, Hustler, and Butternut. New and used equipment on display and operational in our 4000 sq.ft. store. Large SWL department, too. **UNIVERSAL RADIO, 1280 Aida Drive, Reynoldsburg (Columbus) OH 43068; (614) 866-4267.**

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ATV

Ham Television

Bill Brown WB8ELK
℅ 73 Magazine
Forest Road
Hancock NH 03449

Dayton 1990

This year's Dayton Hamvention saw a record number of attendees at the ATV forum and meetings. The ATVQ and Western Washington ATV groups' Friday night meeting saw over 100 hams converging to meet fellow ATVers and watch presentations and video tapes. Jon WM8W had his gigantic ATV kite on display, Mike KDØFW and Bill WB8ELK talked about their balloon adventures, and Carl K5MWN put on an excellent demonstration of his unique flight simulator R/C airplane.

Tom O'Hara W6ORG chaired the ATV forum Saturday afternoon at the Hamvention. The room was packed with ATVers from around the country (and world) who had a chance to find out about the latest happenings in the ATV world. Lou McFaddin N5DID gave us all an idea of the upcoming SAREX missions with some details on Ken Cameron KB5AWP's ATV experiment on STS-37. Spec-Com held sessions at the Ramada Inn both Friday and Saturday evenings. Of particular interest was Harry Tootle's (remember Tootlevision?) presentation which gave us some interesting insights into starting up and running your own commercial low power TV station

ATV Demonstrations

You don't have to wait for Dayton to meet up with other ATVers. If local activity is sporadic or nonexistent, don't just sit around watching a snowy screen. Get out there, spread the word and try to recruit new stations. There's nothing like a good hands-on live demonstration to really show off amateur TV.

Start out with a demonstration at your local radio club meeting. Arrange to have a nearby station send you a picture for some live two-way interaction. Show them what it takes to get started and top it off with a short video highlighting some of the locals hamming it up on television. If there is a nearby hamfest, talk with the program committee and arrange an ATV meeting. Spread the word in your club newsletter, hamfest fliers and any nearby ham or electronics stores. With some good advertising you should draw in a pretty fair crowd of potential ATVers. A good introduction to ATV videotape is available free for demonstrations and meetings from AEA. Write to them at P.O. Box 2160, Lynnwood, WA 98036 and include the club or hamfest location where you intend to show the presentation.

At the Dallas HAMCOM convention this year Andy WY5V chaired an excellent ATV forum. ATVers representing most of the state of Texas as well as Oklahoma and Louisiana were in attendance. It was a good place to find out about neighboring groups and discover their talk frequencies. A number of these groups are close enough to communicate with each other regularly as long as they know where to meet. Andy has been doing his best to stir up new activity in the Dallas area for a number of years with encouraging results. For more info on ATV in the Dallas/Ft. Worth and surrounding area call Andy on either 147.42 MHz or 144.34 MHz simplex. Andy also has a dedicated ATV hotline number at (214) 289-WY5V (289-9958).

The LISAT group (Launch Info Service and Amateur Television System) is located near Cape Canaveral, Florida. Their group is heavily involved in distributing info on upcoming shuttle flights to hams visiting the area. When in the area you can contact members of LISAT via the 146.94 repeater. They hold an ATV net on this repeater every Monday at 8:30 local time. K4GCC also transmits the NASA shuttle video out via an omnidirectional antenna on 434 MHz during missions. He uses a 16-bay vertical collinear antenna at 160 feet which provides good coverage around the space center and surrounding communities.

Photo B. Andy WY5V at the Dallas HAMCOM ATV forum.

LISAT holds an ATV meeting four times a year at Merritt Island, Florida. This year they were able to really thrill everyone with live video transmitted from an airplane as it flew in to the meeting. You can contact LISAT via Ernie Baldini K4RBD, 453 Watts Way, Cocoa Beach, FL 32931

Linked ATV Repeaters—Texas Style

The Tyler/Kilgore area of east Texas is home to two ATV repeaters. The W5KPZ repeater in Tyler operates with 434 MHz in and 421.25 MHz output. The K5KFC repeater, 26 miles to the east, is active with 439.25 MHz in and 426.25 MHz out. The two repeaters are linked up with two T.D. Systems FM ATV transceivers on 1255 MHz. Operating with just 1 watt of power, this provides both repeaters with a consistent snow-free link.

As long as no one is using the local Tyler machine, anyone operating through the Kilgore repeater will also be linked over and repeated out via the Tyler machine. Likewise stations in Tyler are linked automatically over to the Kilgore repeater. Both machines can be used independently (local TV contacts take priority over the link video) and the link activates itself whenever one of the repeaters is not in use. Jim WB5NLF in Shreveport, Louisiana, can work on over to Tyler (100 miles) with excellent signal levels a good share of the time.

In addition to the linking capabilities of the Tyler machine, Dave W5KPZ can also access the local weather radar by touchtone control of a 434 MHz (ATV repeater input) transmitter located at the channel 56 television site 30 miles away in Jacksonville, Texas.

The weather radar feed can be seen through both ATV repeaters and is a great help whenever the Skywarn net is activated during severe weather. Several fire and police departments in surrounding towns have installed downconverters to view the weather radar from the repeater. It's a great help to the whole community to know in advance when severe weather and tornadoes may strike.

Recently, the power of ATV weather radar was dramatically demonstrated. The Skywarn net was activated to investigate a line of severe thunderstorms approaching the area. The net control tuned in the weather radar feed and directed the mobile storm spotters to observe a particularly intense pocket of thunderstorm activity. The was a small hole right in the center of the storm that looked like the eye of a hurricane. Arlyn AA5BY approached the area and observed a tornado skipping across the highway just a quarter mile ahead! Tracking the tornado by weather radar ATV and chasing it across east Texas by car, the Skywarn group was able to relay its position back to the Shreveport Weather Bureau so that towns in the tornado's path could be warned. Walter KE5WH was able to take some excellent videotape footage of the rampaging tornado which was seen over the local TV stations several nights in a row.

R/C Flight Simulator With ATV

One of the most impressive displays at the Dayton Hamvention ATV forums was Carl Berry K5MWN's quarter scale airplane R/C complete with onboard color TV camera. Carl has modified an arcade racing game to simulate a complete aircraft cockpit. Using the ATV downlink signal, Carl can taxi it down the runway,

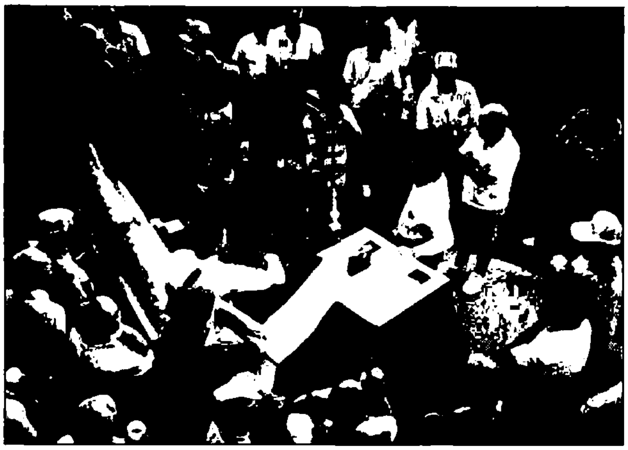


Photo A. Crowds gather around the K5MWN ATV R/C flight simulator at Dayton Hamvention.

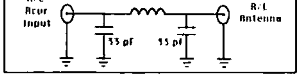


Figure 1. 75 MHz Low Pass Filter for R/C receivers. (courtesy of P.C. Electronics)

Photo C. Dave W5KPZ demonstrating the linked Tyler/Kilgore repeater system.

Photo D. K5MWN R/C aircraft with onboard color TV camera.

Photo E. R/C airplane with flight simulator in the background.

take off and land, without ever having to look at the model. The R/C ATV downlink is received in full color on a large TV screen right in his cockpit, allowing him to actually "fly" along with his model. He can even fly in formation with other modelers. Since the flight simulator is very close to flying a full-size plane, it takes a certain amount of flight training to fly it well. It's a totally different experience from flying an R/C model while looking at it.

His first attempts at using the 70cm band were not very successful, due to interference caused by the nearby ATV transmitter to his R/C receiver, so Carl used a 1 watt PC Electronics transmitter (TX-33) on the 900 MHz band. No interference problems were encountered, resulting in some really spectacular flights. In the near future, Carl will be trying out PC's new TXA5-RC for radio-controlled ATV on the 70cm band. With proper shielding of the R/C receiver, the 70cm band should work out well for R/C aircraft.

Choke Your R/C Receiver

Since we're on the topic of R/C aircraft using ATV, I thought I'd pass along some hints by Tom O'Hara W6ORG to help your R/C receiver get along with a nearby ATV transmitter. It seems that putting a 1 watt ATV transmitter next to an unshielded R/C receiver can spell disaster. You may have control of your plane at close distances but as the signal gets weaker your ATV transmitter signal can capture the first mixer of the command receiver, and down goes your model!

Through proper shielding and the addition of a low-pass filter at the R/C receiver, you should retain complete control of your plane. The first step is to mount the receiver in a shielded box using small pieces of PC board, copper or brass sheet. Mount a low-pass filter right at the R/C antenna input. (see Figure 1.) This filter should pass everything below 72 MHz but roll off a good deal of the 70cm ATV signal.

To test things out, place your R/C model at your maximum usable range for good control. Turn on the ATV transmitter and see if you still have control. If not, move your model closer to the R/C transmitter until you regain control. Add some 220 pF bypass capacitors on the positive power and servo lines. You can also adjust the ATV antenna and R/C antenna for best separation. Try to keep the ATV leads away from any R/C lines. If these changes still don't improve things enough, you may have to run each servo output lead and power line through 500 pF feedthrough capacitors with ferrite beads mounted on each side. Shield your ATV transmitter and camera in the same manner. The video feed can be left as is since it is already shielded by coax. Appropriate feedthroughs are available from the Marlin P. Jones catalog, phone number (407) 848-8236. They are listed as part number CF-1960.

Keep'em flying and stay tuned! 73

Number 31 on your Feedback card

PACKET TALK

Latest in Digital Hamming

Brian Lloyd WB6RQN
124 Churchill Avenue
Palo Alto, CA 94301

More on 800 Hz Shift

The other day I got a telephone call from Andy Dimartini, President of Digital Radio Systems, Inc. (DRSI). It seems that Andy tried my idea of using the V.23 mode of the modem on the PC*PA and discovered that it worked better than the Bell 202 modem mode. He gave me instructions on how to switch the modem in the PC*PA from Bell 202 to V.23. Here are his instructions:

*V.23 is selected by taking TRS (pin five), TXR1 (pin 13), and TXR2 (pin 12) to ground. So, in general any PC*PA 1200 baud port can do V.23 by lifting pin 10 out of the inverter's socket* [I presume he means on the Type 1 board–WB6RQN], *and then grounding pin five on the modem. The modem's internal logic resets to the new configuration on the next power-up.*

This will work with any TNC that uses the TCM3105 modem chip. I modified my PC*PA slightly differently from the above instructions. Here's how:

Carefully remove the TCM3105 chip from its socket and bend pin five out so that when you plug the chip back in, pin five is disconnected. Connect the free end of pin five to ground. A convenient ground is pin nine on the same chip.

If you have a TNC where the modem chip is soldered to a board, the modification is more difficult because you will need to cut a trace on the circuit board and solder a wire from pin five of the modem to ground. If you are feeling exceptionally industrious you can add a small single-pole double-throw switch to change between V.23 and Bell 202 modes. That way you can make the change more or less on the fly (remember that the chip must have its power removed and reapplied to switch modes).

More on 10 Meter Packet

I received a nice letter (via BBS) from Andy N6VRP. Andy had a few good questions:

I read and enjoyed your article in the latest 73 on 10 meter packet. It was particularly timely for me since my latest project has been trying to connect with my home BBS (WW6L) using the nighttime ground wave propagation. I have had no luck as yet. It seems harder to punch through the hill between us (my QTH is Half Moon Bay) on 10 meters than on two. A better antenna should do the job. Ground wave 10 meters should have a lot of future for packet. There is no QRM at all at night.

A couple of items in your article bothered me. I hear WW6L at 28.1869 SSB on my HTX-100. He reports his transmit frequency as 28.190 as it reads on his dial. This corresponds to the upper tone 2100 Hz above the nominal carrier read by my dial. I believe this is the standard way of reporting frequency. Your article, however, implies that frequencies are reported on the midpoint. I have never seen that done.

A friend of mine has a Uniden 2600 and observes a long (over a second) hang time going from transmit to receive. AES refused to fix it, saying that it was normal for the unit. This would be deadly for packet, but you don't mention it. Do you have a mod to fix it? Or were you just lucky with your sample?

I really enjoyed the article, it hit my current interests exactly.

73 Andy (N6VRP @ WW6L)

Well, Andy, I am glad that the article hit your interests. I think that 10m is an almost unused resource for packet. As for tuning, there are many different ways to calculate your frequency. The technique I suggested in my May column is to calculate the center frequency between the mark and space tones, then add (USB) or subtract (LSB) this number from the carrier frequency to determine where your signal is. This technique works regardless of whether you are using upper or lower sideband. It identifies where your signal actually is in the spectrum. This is how a spectrum analyzer would display your signal and it is how the FCC sees it.

On the other hand, you are quite correct in that there are many people who subtract the high tone from the "desired" frequency to calculate where to set the frequency of the radio. This technique works so long as both stations agree to use upper or lower sideband. It also means that most of your transmitted power will be on one side or the other of the "desired" frequency. The bottom line is that it doesn't matter how you calculate your frequency so long as both stations use the same technique and your signal stays inside the spectrum allocated by the FCC.

As for the HR2600, mine also exhibits a long receiver recovery time but mine seems to recover more rapidly than one second (hi) since I seem to be able to copy stations with a 300 ms TX delay. You must also remember that most TNCs insert an extra ACK delay before switching to transmit. This extra delay is inserted by the TNC to accommodate some TNCs that occasionally drop carrier momentarily between packets. This extra ACK delay takes care of most radios that have an excessive receiver recovery time. In any case I will do some more experimentation with my own HR2600 to quantify this problem and to try to find a way to improve receiver recovery time.

Something Else to Try

Almost all terrestrial packet radio operation is half-duplex. You either receive or you transmit, but you certainly don't do both at the same time. There is another way to do it: You can use full-duplex to transmit and receive at the same time. Satellite users have been using full-duplex for some time now since it is relatively easy to transmit and receive at the same time through the satellite.

But why bother? Full-duplex requires you to have a separate transmitter and receiver. If you try to do full-duplex in a single band you need a very bulky and expensive duplexer, hardly something you are likely to have kicking about in your junk box. Well, I can attest to the value of the effort. Just what does full-duplex operation buy you? Well, in the data communications industry the standard calculation is that half-duplex will yield about 40% of the total throughput of full-duplex. My experience in packet radio is that this is more like 20%–30% because of the long turnaround times of the TNCs, modems, and radios.

Running a full-duplex link with another station is a real revelation. Your file transfers complete in a third of the time it usually takes. The AX.25 protocol can finally take advantage of its ability to use sliding windows (send the next packet even though the first packet hasn't been ACKed yet). When doing a file transfer your transmitter comes on and stays on while the receiving station transmits ACKs for every packet that comes in. If you have a good file transfer program like the FTP utility in the KA9Q Net/NOS program you can actually send files in both directions at the same time without slowing the transfers down at all!

The key to operating full-duplex inexpensively is to operate crossband, i.e. station A transmits on 2m and receives on 70cm while station B transmits on 70cm and receives on 2m. If you have one of the dual-band radios that include full-duplex capability you have everything you need already. Just enable the full-duplex mode of the radio and issue the TNC command FULLDUP ON to your TNC. This prevents your TNC from waiting when it hears something on the channel. It just goes ahead and transmits anyway.

But what if you don't have one of those expensive dual-band radios or it 2M/70cm isn't convenient? I have found that the easy and cost effective way to make this work is to use a scanner for the receiver. Most scanners today will copy the 6m, 2m, and 70cm bands, and some will even copy the 220 MHz band and the 33cm band (902 MHz) as well. Radio Shack had a sale not long ago for a programmable handheld scanner that would be ideal for this use (it was under $100). All you need is a transmitter. If you have a 2m rig and a scanner for a receiver your partner can have a transmitter for almost any band and you can enjoy full-duplex operation.

There are some caveats with full-duplex: You can't share a frequency with any other stations; full-duplex operation is strictly point-to-point. So, when and where do you use it? How about on backbone links between NET/ROM, TexNet, or TCP/IP nodes? Here the flow of data would be GREATLY improved. It would go a LONG way toward eliminating the NET/ROM overload problem.

Try it and see. I think that you will like the difference. No, it is not for everybody, but for those who can use it, it offers a great improvement in performance. ■

QRP

Number 32 on your Feedback card

Low Power Operation

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

Crystals, VXOs and VFO

During the Dayton Hamvention, a lot of people asked me why most QRP transmitters are crystal-controlled. The answer is really quite simple: STABILITY. However, crystal-controlled transmit does have several drawbacks. The number one problem is not having the correct crystal on hand when a BY4 is calling CQ. No one hears him but you and the only crystal you have is 3 kHz away!

I've always had a weak spot in my heart for FT-243 crystals. They were produced by the zillions during World War II. In my last transmitter project described in these pages, I used an FT-243 crystal. That will more than likely be the last one I build for some time. The price of FT-243 crystals has gone out of sight. I had to pay about $9 for each crystal. This is way too much for a small project. True, they don't wear out, and should last forever, but like the rest of the hams I know, I'm a tad on the cheap side.

From my side of the street, we have three options. First, we could continue using crystal control for our transmitter. Second, we could modify the crystal control scheme into a Variable Crystal Control or VXO. This gives us the stability of a crystal plus the movement of a VFO. And ultimately, we could use a Variable Frequency Oscillator or VFO. This last option has caused many a QRPer to go back to option number one.

Wanderies and Wobbles

What do we look for in VFO design? Well, VFO performance requirements are many and varied. Can we use (get by) with VXO operation? Will the end project be for mobile/field use? What about temperature extremes? As you can see, a lot of questions must be answered.

For our needs, long-term stability is foremost. If you've ever worked a station whose VFO moved on you during a QSO, you know the problem. Many people call this the "wanderies." The VFO wanders back and forth.

A second problem we must look into is called short-term stability. This shows up as woops and doops on your frequency. I like to call these the "wobbies."

It is really beyond this column to get into the ways and whatnots of a PLL circuit, so we'll just look at oscillators using LC circuits. Most of the common Colpitts and Clapp circuits can be used for VFOs. We won't get into the circuits this time, but we will take a good look at the hardware end of VFO building.

Keep it Cool

I've seen some really good VFO circuits fall flat because of unsatisfactory construction by the builder. What, then, can make or break a VFO? Several rules must be followed.

Use only the feedback necessary to keep the oscillator running. This will prevent (reduce) loading and pulling from the external load connected to the VFO. Keep the power level low. No need to convert the VFO into a 1-watt transmitter! This will only increase internal heating of the VFO's components. This is a real no-no. For good long-term stability, we must keep the VFO's components COOL.

Keep all heat-generating components away from the VFO. This includes PA transistors and power supply regulators. There are several tricks of the trade you can use to keep the VFO cool. One of the best tricks is to use several smaller capacitors in the LC chain instead of just one large capacitor. This will reduce heating of the capacitors.

The last rule must be to choose VFO parts very carefully. In the past I've always used silver mica caps for my VFOs. And I've always had some trouble keeping the VFO in one place. I've found out, through several Official Observer reports, that silver mica caps can produce unpredictable results. Polystyrene capacitors are a very good choice for VFOs. They are hard to come by, however most of the bigger mail order catalogs do stock them. You can also use NPO ceramic capacitors. DON'T use common ceramic caps for a VFO; the capacitors must be marked NPO.

After Capping it Off

If you're careful about capacitor selection, the next problem area is the VFO inductor. This one has always come back to bite me. If you use a toroid, you're going to have long-term stability problems. A toroid will change characteristics as the temperature changes.

Even the windings can change the frequency. Some builders wind the toroid and then boil it in water for several minutes. This anneals the wire, making for less drift as the temperature changes. The best choice would be a slug-tuned coil. However, these are very costly and hard to come by. If the slug-tuned coil has a low *Q*, we find the same problems as with the toroid core. Use only a high *Q* inductor.

All inductors must be mechanically secured to the VFO circuit board. In the past, the use of "Q dope" was the best bet. Well, I've never seen a bottle of the stuff. I use RTV, also called silicon sealer. It comes in a toothpaste-like tube and takes about 24 hours to set up. RTV can be messy to work with, but it does the trick. On the down side, it's almost impossible to remove the stuff. So if a part goes bad, get out the X-Acto™ knife and slice into it.

The last major trouble spot is the main frequency capacitor. For lack of better wording, the main "tuning cap." I would sure like to tell you to only use a double-bearing capacitor for your VFO. However, if you could find one, you wouldn't be able to afford it! So we are stuck with using whatever we can scrounge up.

I thought I had some really good luck when I purchased some surplus capacitors. Just the ticket for VFOs. They worked just great, but the trouble was that you needed a pipe wrench to turn them. Most of the time, an imported vernier mechanism is used for tuning the VFO, but it just doesn't have the torque to move the variable capacitor.

When you're putting your VFO together, avoid the use of double-sided PC board. The extra capacitance will cause trouble. Keep lead length as short as possible. Long leads will show up as inductors. These can, and do, cause parasitic oscillations. The same goes for PC traces. The traces must be short, direct, and to the point.

Make it Tight

This section is essential reading for builders of direct conversion transceivers. The VFO must be enclosed in a shielded RF-tight box. Transmitter RF can get back into the VFO and cause all kinds of critters to get out. Use feed-through capacitors for operating voltages and RIT circuits. Miniature RG-174 cable should be used between the VFO and stages of the first amplifiers.

Have you ever built a transmitter that seemed to work just fine with a dummy load, only to have an 8:1 SWR when you connected it up to the antenna? I have. Traced the critter back to the VFO. Seems the VFO did indeed have output on 7 MHz, along with a dozen other frequencies! I have two different methods of finding these unwanted frequencies.

First, I use a frequency counter. If the counter cannot lock onto the VFO's output frequency, you're getting more than one output. Second, I couple the output to my oscilloscope. The output should be a nice clean sine wave; if the wave has fuzzes (intentional distortions) on it, you've got critters riding on the output. Break out the de-coupling capacitors and ferrite beads. You're going to need them.

So the next time you're talking to someone using a new super rig with 400 memories, six VFOs and dual 4-1000s, tell 'em your rig is also quartz-locked frequency controlled. Running 2 watts! Next time we meet I'll have some guidelines and simple circuits for VXOs. ■

Never Say Die

Continued from page 4

no votes from your club in the next election.

It may be a difficult concept to accept, but the ARRL is supposed to be serving amateur radio. Us. It's supposed to be responsible for making amateur radio fun, maintaining its growth and preserving its future. Well, their DXCC award is doing exactly the opposite. It's generating enemies for us in Third World countries. It's helping to turn away potential newcomers.

The Contests

Six DX contests a year, eh? Every couple of months all hell will break loose on the HF bands as DXers vent their pent up energies into an orgy of contesting. Sounds like fun. I love contests. I'm very good at 'em.

By having more "official" DX contests we'd encourage DXers to invest more time and money in their super stations. Clubs would put together multi-op setups. DXing would be more organized and might be even more fun. After all, only about half of the 400 IARU countries are usually active.

By concentrating contests into six weekends a year we'd also concentrate DXpeditions into these weekends. The result would be more clubs putting on DXpeditions in order to activate rare countries during contests. We'd all have more fun.

With DXpeditions liable to come on at any time DXers have to be ready when they fire up. With them only counting during scheduled contests DXers would be able to spend a little more time with their families. It might help cool their monomaniacal approach to DXing, making it fun rather than a life and death struggle.

Contesters are usually after every contact they can find during contests; true blue DXers will be after new countries. I got on in a contest a while back and, operating only on 20m phone, I contacted 100 countries in the one weekend, so working new ones during contests shouldn't be a serious handicap.

If I were running the League I'd get together with the IARU member societies and see which are most interested in running worldwide DX contests. I'd have the IARU certify six contests a year for all award credits. The IARU is run by the ARRL, which pays most of the bills for its operations, so the League should be able to get any agreements it wants.

Indeed, many IARU member societies get far more money out of their membership than they contribute just in trips for their delegates and their wives to IARU meetings which are paid for by the Union. The difference is made up by our benevolent ARRL, which uses this financial leverage to keep the member societies in a puppet relationship. Money may buy subservience, but it doesn't buy love. But of course, since you read the ARRL board minutes and the IARU column in *QST*, plus you undoubtedly discuss with DX ops how they feel about the ARRL and the IARU, you already know all about this miserable mess. Unless of course you are a poor Tech and are thus isolated from most of the ham world up on our lonely two meter outpost.

The Usual Digression

Speaking of Techs (well, writing), and if you are a Tech, to make a nag of myself (anything said twice is a nag), isn't it about damned time you bought my crummy 13-per code tape and spent about ten lousy minutes a day for maybe a week or so to pass the rotten code test? How many years have you been putting off this stupidly simple job? Lordy! Kids five years old can hack it. Has your brain really been so badly mushed by our incredibly awful educational system that you can't get yourself to do *anything*?

How am I going to get you to read, make some decent money, or develop some conversational skills so when we are in QSO I'll be able to get you to talk about something? How am I going to get you to stop swilling beer, slim down that disgusting paunch, get rid of your electric security blanket, kick the vile smoking drug habit and otherwise go about extending your life so we won't run out of hams so soon? I hear that death knell sounding with every "Silent Keys" column in *QST*.

Smoking. Since you probably don't read anything but ham magazines, maybe you haven't heard that research has recently shown that smoking is the number one cause of preventable death in America. Number two is alcohol and number three is breathing secondhand smoke. Yep, you're not only killing yourself, you're helping kill your wife, kids and friends.

ARRL—Shape Up

Getting back to DXCC . . . how about making it hot for the ARRL directors on this? You voted these turkeys into office, now get them to do something more than spend your money on vacation trips to board meetings, Geneva and so on. Ask for more than their normal contribution of unanimous votes at board meetings, rubber-stamping the party line.

Write your directors and demand that they get their idiotic and destructive DXCC in hand by limiting DXCC credits only to contacts made during officially authorized contests. And I don't even care if they play their usual politics with this by eliminating contests I got going such as the WPX and Worldwide DX Contests. I would suggest they pick a half dozen contests a year to authorize. And yes, if you get 'em to make this simple move, I'll get the DX Dynasty award rules into line.

You might let that turkey director you elected know that if he doesn't start making some waves you'll find a new turkey to elect. Get him busy updating the DXCC rules. Get him really interested in having the League set up a task force to clean up our bands. And another to seriously get working on ham growth. Make him start to work for the pork he's been getting from HQ.

Meet Your Director

When I first started getting involved with the political side of amateur radio almost 40 years ago . . . when I started editing and publishing my first ham publication . . . I was shocked and dismayed when I met the ARRL directors at conventions. I found myself listening to a bunch of drunks with utter contempt for the members. The worst, by far, was the ARRL general manager and *QST* editor, Budlong. Wow, what a bunch!

As the editor of *Amateur Radio Frontiers* for four years and then as the editor of *CQ* for five years, I got to know these chaps well. As the *CQ* editor I was the only ear ARRL dissidents had, so I heard plenty. Most ARRL members were fiercely loyal to this bunch of jerks and crooks, but I found there were a few members with the intelligence to actually ask questions and . . . horrors, think!

> ***"Has your brain really been so badly mushed by our incredibly awful educational system that you can't get yourself to do* anything?"**

While I have some respect for a couple of the current directors and a lot of respect for most of the HQ gang, the more I hear about the current president, the less respect I have for him. Do you even know who is president now?

Let me put it this way . . . if you chaps out in Colorado re-elect your director I will lose what little respect I have for you. I know Marshall Quiat very well—know him from close personal experience. What on earth were you thinking when you elected him? Just plead stupidity and don't do it again.

Wayne For Dictator?

Several letters have asked why I don't run for ARRL president. I even got asked that during my talk at Hamcom in Dallas this year. Couple reasons. First, since I'm the editor of a competing magazine to *QST*, it would be a conflict of interest. But even if that weren't a factor I wouldn't be interested. I just want to get things done, I don't need or want the tremendous ego gratification such an exalted position would provide.

Yes, if I were to take over and run the ARRL, I think I'd have the organization revved up to the red line area in short order. I'd get the FCC to change the ham regs so we could start defrocking bum hams, even if they can copy 50 wpm code. I'd have one whale of a task force out there, supported by a thousand ARRL member clubs, hunting down every net jammer, every user of ham channels for business and every foul loudmouth. I'd have articles and stories about amateur radio in every newspaper, on every radio station and on TV so that every kid in America would know about it. I'd have the VECs so busy trying to cope with new hams they'd be crying uncle. I'd also be working with the Commissioners to set up a biannual Ham Radio Convention where delegates from clubs would formulate our rules for us.

There Goes Wayne Again!

Look, I agree it's a big job that needs doing, but I guarantee it isn't anything that can't be done. It could be managed by one person, too. Yes, I know how and could do it. Heck, I've tackled jobs like that in the past and I'm in the middle of a terrible mess in the music industry that I want to get cleaned up. Keep in mind, as the editor of *73*, there really isn't much more I can do than point out what needs to be done . . . and how to go about doing it. Beyond that I'd have to start by starting a new national ham organization, a battle which could take years and would certainly further weaken the hobby.

To give you an idea of how I tackle big messes, here's what I'm doing in the music industry. If the League were to go about solving amateur radio problems with similar creativity, we'd be home free.

The American music industry is in awful shape. Six international megacorporations have gotten almost total control of it and are milking it for billions. Would you believe that the six majors in this industry have 96% of all music sales in America . . . leaving only 4% for over 5,000 small, independent (indies) music companies?

Worse, almost all of the creativity and progress is coming from these indies, with the majors tending to fight every inch of the way. So how can I fight an $18 billion well-entrenched cartel? I'm doing it by setting up projects which attack their weaknesses. I have 38 of these projects so far, either in the planning or in action. I call it guerrilla marketing.

The music business works like this: There are the record companies, both major and indies. They sell their records to distributors. These distributors sell to some 15,000 record retailers, who sell to the public.

The distributors are, for the most part, almost totally controlled by the majors. There are a few which specialize in handling indie music, but many of these got into the business because they found they could screw the indies easier than the majors. The majors are big enough to be unscrewable.

The public, oddly enough, tends to buy the music it hears over the radio and sees on MTV. So guess who has almost dictatorial control over radio airplay and MTV? Oh, you guessed! Guess who has reps visiting the major radio stations to ensure what they call rotation play, where their music is put into the cartridges which are played

over and over on most music stations? And over.

Guess who has reps visiting the major retail chains to set up point-of-purchase displays, provide posters and so on? It ain't the little indies.

So how can Uncle Wayne throw a monkey wrench in those well-oiled works? It's a big job, so it takes guerrilla attacks on a whole bunch of weaknesses. I call these my WHIRL projects . . . that's We Help Independent Record Labels. I've got 38 of 'em so far, with more developing every week or so.

What do I mean by WHIRL projects? Well, W01 is Indie Info Inc., an indie credit bureau which helps indies find out which distributors pay and which don't. W02 is a monthly publication, *Adventures In Music*, which goes to some 5,000 radio stations to help music directors know what indie music has been released recently, which is selling best and which is getting hot airplay.

W03 is *Music Retailing*, a biweekly publication which goes to about 10,000 record stores to help encourage them to stock and sell indie music. It also provides information on displays, sales training, computer systems, theft prevention and so on.

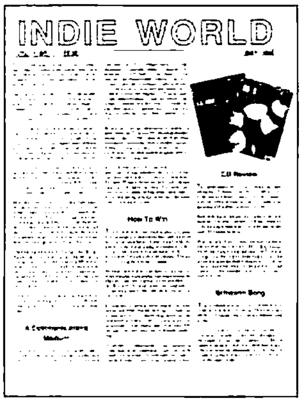
W04 is our CD Bank, a way for indies to swap their compact discs with other indies and thus keep up with what's been released recently, but without having to buy the CDs at retail price.

W05 is Music/NH, a mail order indie music service. M/NH runs a catalog ad in *CD Review* every month . . . plus it sends out a mail order catalog. Most record stores don't want to bother stocking indie music . . . doesn't sell fast enough . . . so M/NH makes it available by mail with fast service and a reasonable price. We tried an ad in *73* a couple months back to see if you would buy music. Yep, you will.

Another benefit of M/NH is that it provides a way to pretest the sales of new indie releases. Those which sell well are then recommended to record stores as proven hot titles via *Music Retailing*.

W06 is what we call a Longcard—it's a 6" x 12" card which is packed with sales information. This card is designed to replace the 6 x 12 longbox or blister packs which have been used by the majors to package CDs. These packages cost you $1 to $2 additional and then you throw them away. This is ecologically terrible . . . as well as a huge waste of money. So we're working to get indies to use Longcards instead of longboxes. This makes it so the stores don't have to update their old LP display fixtures. It allows them to display sales cards for many times as many CDs in a smaller floor space and eliminates theft problems.

W07 is a publishing service to help indies produce better liner notes for their music. Most indies are small and don't have the writers, typesetting, artists, photographers and so on it takes to produce good liner notes. We do.



W08 is *Indie World*, a monthly publication which reaches about 5,000 independent record companies. It helps them keep up with recording techniques and digital technology. It helps them with marketing and industry information.

W09 is Creative Music Marketing, a new distribution system for Indie music. CMM will be getting started in 1991 with a completely new approach to distributing music. Participating retailers will set up Indie Music Boutiques and will be able to make five times the normal store profit from these sales. CMM will be distributing the M/NH tested proven sellers.

W10 is Indie Workshops. In 1991 we're planning workshops to help indies with forums on the latest in digital technology, packaging, distribution, price testing and so on. Target cities are Boston, New York, Chicago, Nashville and Los Angeles . . . where indies tend to be concentrated.

W11 is Greener Pastures Records, my own record company. By producing and marketing music myself I face the same problems faced by all other indies. This helps me work out creative solutions which I can pass along. GPR has already produced two ragtime releases on CD and cassettes (CS), with some bluegrass coming soon . . . and a lot more ragtime.

W12 is a weekly *CD Review* TV program. Fritz Wetherbee, the humorist on my "How To Speak N'hamsha" cassette, is the producer and the show is being developed for 1991 syndication. This is really going to be fun. We have some great video talents here.

W13 is the same idea, but for radio. This is also scheduled for a 1991 debut.

W14 is a weekly *CD Review* newspaper column. We're looking for the right writer for this one . . . someone who can convey the enthusiasm and humor it'll take to make this a winner. Good writers are not easy to find. We have an overkill of information, so it'll be fun.

W15 is the CD-ROM version of our biannual *CD Guide* publication. We're up to over 45,000 CDs listed in the most recent issue. The ROM has the entire list on it, cross-indexed to every review we've ever published. It also has some full color cover pictures and sound samples of many CDs. It's touch-screen operated for use in libraries and larger record stores. This CD-ROM is a quarterly publication.

W16 is our *almost FREE CD Sampler*. The idea is to have one track from each of 16 different indie CDs on each Sampler. The Samplers sell for the crummy $3.49 postage and handling costs, making it possible for people to hear the music indies are putting out . . . something which is difficult to do over the major label controlled radio. We're already moving about 20,000 of these Samplers a month and are gearing up to put out 64 of them a year. These are also being integrated with some later WHIRL projects (22-24-25-28-29).

That's not even half of the projects. We're developing some new ways of selling music . . . through libraries (W24), radio stations (W29), hotels (W25), dance studios (W23), restaurants (W22) and so on. I'll tell you about some of the other exciting projects some other time.

What I wanted to point out is that when you tackle a big job like changing the music industry you can't do it with one little project. I've got a bunch of people here having the time of their lives getting new projects going and building the older ones into bigger businesses.

I'm reminded of the enthusiasm and fun we had back in the early '80s when we had *80-Micro* going strong (third largest magazine in America). We started *InCider* for the Apple, *Run* for the Commodore computers, and a bunch of other magazines and software releases. Our sales were doubling every year . . . and with absolutely no debt!

The same excitement and productivity could be brought to the ARRL, making it a dynamic organization instead of the sleepy bureaucracy we have now. We need teams to be organized to clean up our bands and to get our hobby growing again. We need strong support for all new technologies. We need to make amateur radio come alive so we'll all have more fun.

We need better-run contests . . . and we also need weekends without contests, too. We need awards that are ecologically considerate . . . which don't tend to trash our bands like the present DXCC mess. Our clubs desperately need leadership and guidance. There are far too many that are like old tops . . . still spinning, but running down and near collapse.

Yes, permission is granted to reprint this editorial. You may send copies to your somnolent ham friends. You may publish it in your club newsletter. You may read it over the air.

Docket 90-55

This is the FCC's Communicator proposal. I've submitted a horrendously long reply . . . too long to be printed here. If you'd like to see it send me $5 and I'll make a photocopy for you.

Basically, I oppose sticking all newcomers up on our almost unused (for rag-chewing) UHF bands. I propose, instead, a simplification down to two classes of license . . . for the time being . . . with an end aim of getting us down to only one license class.

How can we get hams to learn more? By making it fun, not by forcing them to memorize Q&As, which are a useless waste of time. You get me some new hams and I'll get them into packet and learning more than they ever thought they would. I'll get them onto OSCAR. I'll get them running around with homemade fox hunting equipment. I'll get them up on 10 GHz. But first I need some new hams to replace the old timers who would rather see our amateur radio bands given to UPS or used for more TV stations than have a no-code license.

Yes, the code is only a tiny part of our problem. . . but it's a critical one. Without no-code I don't think we have a chance. With it, all we have is a chance. . . and then, if you don't give the ARRL an immediate change of directors. . . and I mean this year. . . we're in deep trouble.

If you run into any old "the ARRL can do no wrongers" who get mad at my blaspheming the League, you might clue 'em that one of the directors was sick enough about what's been going on to make a trip and visit me, to make sure I was up-to-date. And you might then ask 'em, okay, let's say that old Uncle Wayne is full of baloney. . . can you argue with any of his recommendations for changes?

Newsstands Too

I cited the music business as being in need of some big changes to get it out of the hands of a cartel. The newsstand distribution business is just as crooked, screwing small publishers almost beyond belief. Once I have the music business cleaned up a bit, I've got some great ideas for helping small publishers get better newsstand distribution.

The one thing I'm not going to do is set up a new national ham organization in order to save amateur radio from the League directors. It's entirely up to you to do that. . . by cleaning house. It's easy. The directors come up for election every other year, so by late 1991 you can have a brand spanking new League. . . one which can be dynamic and make amateur radio what it should be.

Vote out the turkeys. Vote for directors with practical business experience. Look for people with entrepreneurial experience, people who are used to running businesses and making decisions. Let's stop making the director job an ego trip for old traffic handlers and the ARRL party faithful.

The next WARC is coming fast. Are you going to help President Price fulfill his fantasy of spending maybe a million dollars of your money having a ball in Geneva? If you think ol' Uncle Wayne is baloney again, how about Pete Hoover W6ZH and Bill Orr W6SAI, both as solid longtime ARRL supporters as I've ever seen, and both asking Price to step down?

A Consultant?

If the League isn't able to find someone with my understanding of the field and marketing experience, I'm available for consulting, when I have the time. My modest (almost niggardly) consulting fee will go to the Monadnock Hospital Foundation to help fund the new hospital wing.

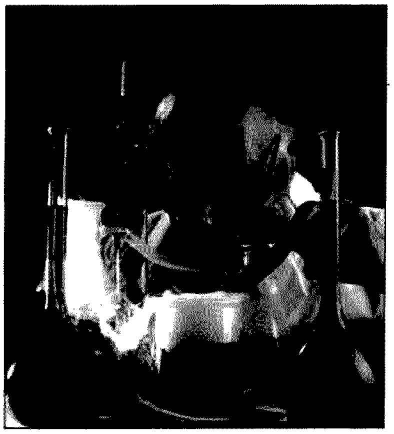
Just as the USSR is in need of help with their perestroika (restructuring), I believe the ARRL may need some outside help to cope with their needed changes and restructuring. I'll be glad to help.

I've been helping the local health services as treasurer and trustee of the Monadnock Hospital Foundation. I'm also chairman of the Strategic Planning Committee, where I'm bringing the health services, day care and nursing homes into an integrated group of services, all tied in with the hospital and satellite medical offices in the surrounding towns. We'll be providing health and health information services, aimed both at keeping people healthy and repairing long- and short-term health problems.

Getting my area of New Hampshire organized as a model of what small town health care should and can be for the next two decades is a great challenge. I love it. So there's where any consulting fees will be invested. This isn't blue sky. The ground-breaking ceremonies for our new $8 million hospital wing were held a few days ago, with completion scheduled for 1991.

So yes, I keep pretty busy for a 68-year-old. I realize, working in the health business, that every day is a crapshoot, with the odds getting worse every day. Will it be a tumor, cancer, stroke, heart attack, a jealous husband or a fall from my scooter? Maybe it'll be a tree when I'm skiing or an embolism when I'm diving? In the meanwhile I'm working every available minute to help Monadnock health planning, to fight the international music cartel, to fix America's broken educational system, and to try and save amateur radio from its old-timers.

Oh, I still manage some time for reading, TV, movies and some trips. Did I mention getting to the Grand 'Ole Opry, when I was in Nashville recently? Or my trip to Sedalia (MO) for the Ragtime Music Festival? Probably.



Sure, I think I could get the ARRL up and moving, doing everything and a half we need to have done. . . and without a lot of expense either. I tend to come up with a scheme for every new project to pay for itself. . . maybe even make some profit. Old hams with a money complex frequently say that old Wayne is doing this or that just to makemoney. Or I'm doing something to get more subscriptions. I can't think of anything I've ever done where money was the main goal. Sure, the more sub-

QSL of the Month To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock, NH 03449. Attn: QSL of the Month. Winners receive a one-year Subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

scribers to *73*, the more advertisers we'll attract. . . and the more advertisers, the more pages we'll have for you. That's simple.

Of course you can help. . . by getting your friends to subscribe. . . by making sure the *73* advertisers know their ads are working for them. You can also help by letting those firms advertising in *QST* know that you'd like to see their ads in *73* so you'll have a bigger magazine. You might even hint that you'd buy more that way.

Over the last 30 years *73* has pioneered digital communications, solid state, SSB, SSTV, repeaters, NBFM, RTTY, computers, home construction, OSCAR, packet and so on. With your support *73* will go on, helping new technologies be developed. Despite the daily crapshoot, I'm in good shape and expect to be around giving you hell about your failings for many more years.

Look, if wishy-washy weak-willed Wayne Green can take off 85 pounds, so can you! Techs, if poor old dumb Uncle Wayne managed to pass the stupid 13 wpm code test (50 years ago), almost anyone can. Heck, I can pass it again, if you give me about two days to practice, even in my advanced state of mind decay.

That photo of me in my lab? I'm working on a new molecular configuration for impregnating CDs to stop bit-rot. It'll be on the market soon (W38) and it will do everything but the dinner dishes. I'll be looking for sales reps.

HAM HELP

Number 36 on your Feedback card

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS. Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters 1 or i, or even the number 7. Thank you for your cooperation.

Wanted: All info on connections for the Digicom 64 board to a Heath HW24HT, and any info on program set-up. Thanks. *G. Ebersole KA3UOJ, 536 New St., Roaring Spring PA 16673.*

Help! I want to get started in amateur radio through the HF bands, but have no money for a rig. Any one of you helping Elmers out there willing to donate any old HF gear to a young fellow like me? Will pay freight charges. *Victor Doplito, 18966 Woodland, Trabuco Canyon CA 92679.*

I need a copy of a schematic/operating manual for a Clegg Mark 3 (it's an old rock-bound 2m rig). *Klaus Spies WB9YBM, 8502 N. Oketo Ave., Niles IL 60648-2006.*

I am trying to contact radio amateurs in the USA who run Commodore computers. I run a computer/radio users group here in the UK and we want to get involved with either individuals or groups who run CBM machines in the USA. *The Commodore Radio Users Group, c/o Simon Lewis GM4PLM, 66 Camperdown Court, Helensburgh, Strathclyde G84 9HJ, England.*

I need interconnect data for wiring a Tandon TM-502 hard disk to its driver card. Willing to pay reproduction and mailing costs. *Ralph Alsmeyer KA1DQ, 1415 Tahoe Ct., Lake Worth FL 33461.*

Wanted: A schematic or service information for a Genave Mobiline I VHF (150 MHz) transceiver with a type Q receiver. I will pay for copy and postage, or will copy and return. *Don Bray WD5DON, 3209 Rodd Field Road, Corpus Christi TX 78414.*

Wanted: Owners manual and schematic for Siltronix LA-650 linear amp. Will pay copy cost or copy and return. Thanks. *H. Sellers, 343 Estep Ln., Waverly OH 45690.*

CIRCUITS

Number 37 on your Feedback card

Great Ideas From Our Readers

Have a quick'n'easy circuit idea? Share it and get a one-year subscription or extension to *73*! Clearly mark all entries as submissions for Circuits to distinguish them from manuscripts. Send your entries to Circuits, *73 Magazine*, Forest Rd., Hancock NH 03449.

PTT Time-Out

After several instances of "timing out" my favorite repeater, I designed the following circuit. The heart of this circuit is the 555 timer, a readily available IC capable of long time delays. Using the formula $t = 1.1RC$ (with t in seconds, R in ohms, and C in farads), the length of "maximum PTT" can be calculated (see the table). The values given are for a three-minute timer. Check with your repeater group to find out the time on your local machine.

The 555 is held in the reset mode by holding pin 4 at a logic high through pull-up resistor R1. This ensures that the full time-out period is available at the beginning of each PTT. The low-going PTT signal is passed through the inverter to one input of the AND gate, and also to the MC14538 resettable dual monostable oscillator (operating in the non-retriggerable monostable mode). The NOT-Q output of the MC14538 is used to provide the proper length trigger pulse for the 555, which goes into the set mode and provides the other input for the AND gate. The output of the AND gate is used to turn on Q1, a buffer which keys the transmitter. When the microphone is unkeyed, one input of the AND gate is lost, pin 4 of the 555 goes high and the circuit resets. If the operator is a little long winded, the 555 time period will elapse which will remove its input to the AND gate, causing Q1 to turn off, unkeying the transmitter.

Remember to tie the inputs of unused gates of the 14538 and 4081B to the proper logic levels as shown on the schematic. If possible, place the unit inside the transmitter itself, or mount the unit in a metal box, making liberal use of bypass capacitors.

$T = 1.1RC$

T_s	R_Ω	C_F	
180	1.6M	100µF	180s = 3 min
150	1.3M	100µF	150s = 2 1/2 min
120	1.1M	100µF	120s = 2 min
90	818.2k	100µF	90s = 1 1/2 min

(FOR 555 TIMER)

C=100µF TYPICALLY REQUIRES MORE EXPENSIVE LOW-LEAKAGE CAPACITORS.

Table 1. Values for Diverse Duty Cycles

You may reach Klaus Spies WB9YBM, author of this circuit, at 8502 N. Oketo Ave., Niles IL 60648, for PC board or stuffing diagram information.

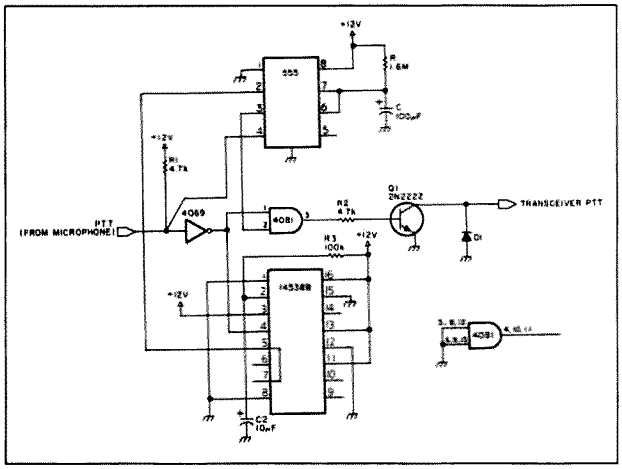


Figure 1. Schematic of the PTT Time-Out circuit.

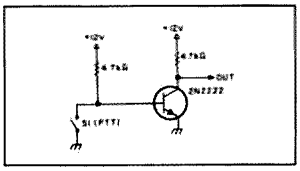


Figure 2. A simple inverter.

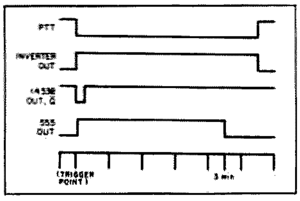


Figure 3. Timing diagram.

ABOVE AND BEYOND

C.L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake
San Diego CA 92119

ARRL Convention

The Southwest Division ARRL Convention is being held in San Diego this month at the Town and Country Convention Center in Mission Valley. This is about ten miles from my home and I plan to be there for all activities. Plans include presentations by Ed Munn W6OYJ, "Introduction and Overview"; Gordon West WB6NOA, "VHF/UHF DXing"; Bill Burns WA6QYR, "Mountaintopping"; Chuck Swedblom WA6EXV, "3 cm Band"; Jack Henry N6XQ "24 GHz"; and Steve Noll WA6EJO, "Lasers." After the main program on Sunday, there will be equipment displays and demonstrations.

If you have built or modified something you're proud of, bring it, and a table will be provided to display it. The presentations are scheduled from 9 a.m. to noon. If you plan to bring anything, contact Ed Munn W6OYJ, 6255 Radcliff Dr., San Diego CA 92122. Tel. (619) 453-4563. The convention runs from Friday, August 24, to Sunday, August 26. Hope to see you there.

Switching Power Supplies

Last month I covered the Linear Technologies switching power supply. This month I have a home-brew version of a similar power supply that you can construct from parts using a standard 110 AC to 24 volt center tapped transformer. Kerry N6IZW came up with the circuit that uses the secondary of a 24 volt transformer to switch the 12 volts DC across at a 60 Hz rate. The primary of this transformer is now used as the output to supply 60 Hz at 110 volts AC. This circuit can be adapted to a toroid for 12–24 volt use as originally intended, but it will have to wait until the proper toroid is found. Here is how the AC transformer works.

As an example, if the transformer is capable of 24 volts at 3 amps, the 110 volt output should be good for about 35 watts. (12 volts switched across half the input times the current rating of 3 amps.) While this might not be completely true due to efficiency and transformer losses, it is good enough for demonstration purposes.

Testing the switcher, we found that small portable TVs and light bulbs of appropriate ratings worked well. I changed the output transformer to one that had a 22 volt, center-tapped winding, current rating 10 amps. Again I used the 110 side of the transformer as the secondary, as before, and I was able to obtain about 120 watts from this transformer. (Dropped input voltage to 11 volts to hold output to 120 volts AC.) I used a solid state RGB computer monitor, a 25 watt fluorescent light, and a small AC fan for the test load. Total run time with all appliances loading the circuit was about an hour and a half. The heat sink that the power FETs were attached to was just warm after one hour of continuous use.

This should demonstrate the benefit of low "on" resistance that these power FETs have. If transistors were used, the heat sink temperature would have been quite high, and I suspect that forced air would be needed to properly cool the heat sink. By the way, the heat sink used was an eight ounce block of scrap aluminum. The FETs were bolted to the heat sink with insulators and a small dab of heat sink grease.

One word of caution about using power FETs. With all power switching circuits, you need to be aware of power supply spikes, noting in this case the FET's drain puncture voltage. The device can be destroyed if this rating is exceeded by the voltage spike on the leading edge of the switching waveform. In the case of the IRFP-140 device, the voltage rating is 100 volts. The spike was observed to be 45 volts on the 120 watt transformer (under load) that I used. Provisions were made to the PC board to add voltage spike suppression components at a later time. This network might be a series resistor diode capacitor network to ground from each drain. I'll keep you informed on new developments as they come up.

Switcher Circuitry

The circuitry for the switcher is very simple and requires only two ICs, a 4047 multivibrator and a 4049 hex inverter. The frequency of the 4047 multivibrator is set by an RC constant using a 37.8k resistor and a 0.1 µF capacitor for 60 Hz operation. The actual resistance is made up of a ¼ watt resistor and a series 10–20k potentiometer, which gives a range for fine frequency adjustment. Originally the power switcher was to be used for a 12 to 24 volt toroid type supply. When suitable toroids become available, I'll construct it. For 40 kHz switching, operating with a toroid, you'd change the 0.1 µF capacitor to 400 pF, and the resistor total to 14k; for 60 kHz, you'd change the resistor to 9.46k.

To calculate your own RC values, use the following formula: Period = 4.4 x (R x C), with resistance in ohms and capacitance in farads. The period is converted to frequency by dividing it into 1. For example, using a 0.1 µF capacitor and a 37.8k resistor: Period = 4.4 x (37,878 ohms x 0.0000001 farad), which equals 0.01666632; 1 divided by 0.01666632 = 60.00124803 Hz. As per the example above, that would equate to a 20k pot and 18k fixed resistor with a 0.1 µF capacitor. This would give sufficient range to trim frequency.

The switcher circuit pc board pattern is shown in Figure 1 with parts placement indicated in Figure 2. Don't let the simplicity of this circuit fool you; it works very well, considering that it uses fewer than a dozen components. You can easily duplicate the circuit with other power FETs. The PC board is not necessary, just a refinement. If you can't locate a supply of FETs (the only key component), I will provide a mini-kit with PC board (ready to drill), a pair of power FETs (surplus), and a few other parts for $15, or only a pair of FETs for $5. All costs postpaid U.S.

This power supply is not limited to just 12 volts input. Depending on your transformer selection, it could be any other voltage for your application. Just don't exceed good engineering practices, trying to push ratings too high, and you will be OK.

These power FETs provide many different design applications to ponder. If higher currents are needed in your application, the power FETs can be paralleled directly without equalizing resistors. FETs are basically degenerative with respect to temperature. As the temperature increases, internal resistance increases, which limits device current. This means that FETs can be paralleled without equalizing resistors, as they will share the load and shift current as a natural function of the device. This is in sharp contrast to power transistors. As transistor current increases, so does temperature, until thermal runaway and destruction. For power FET information, contact International Rectifier, 233 Kansas St., El Segundo CA 90245.

Publication Information

Recently I was made aware that *VHF Communications*, a magazine devoted entirely to VHF/UHF and microwave communications, is now available in the US. A product of West Germany, it's a source of excellent articles translated to English. Being totally devoted to microwave topics, the articles go into great detail and have full-size layouts and photos for easy duplication of the projects and activities going on in Europe.

Several years ago, Red W6BLK first introduced me to this magazine, but I lost track of it until recently. TimeKit, PO Box 22277, Cleveland OH 44122, tel. (216) 464-3820 is the U.S. distributor for this quarterly publication. Subscription cost is $20.95 per year.

Mailbox Comments

Bill in Linden, New Jersey, wants to know how to connect and calibrate his frequency counter using WWV with his Realistic DX-300 receiver. Well, Bill,

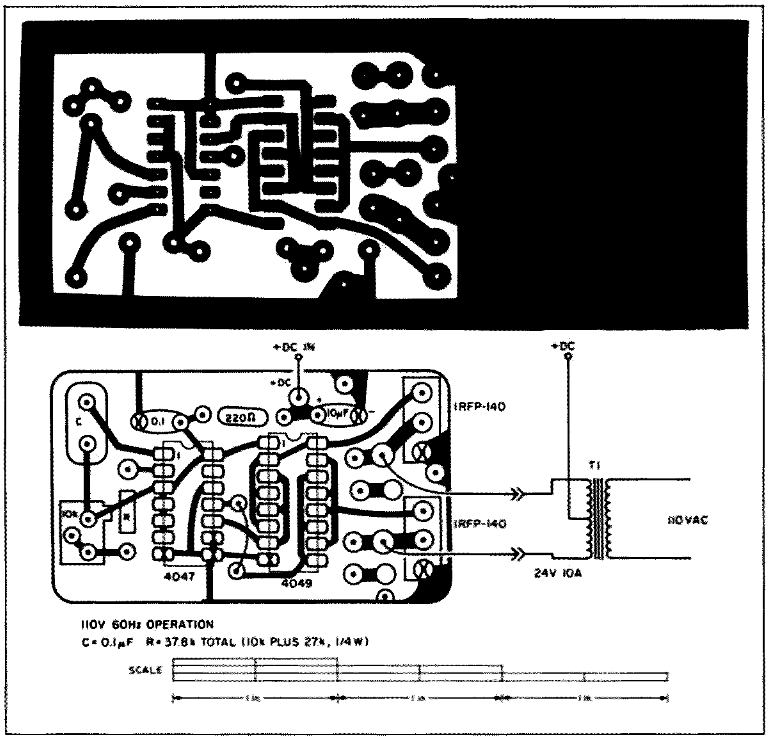


Figure 1. Switching power supply foil pattern and parts placement.

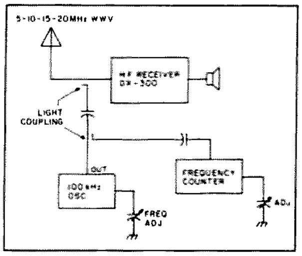


Figure 2. Frequency counter calibration using WWV and 100 kHz oscillator as a transfer standard: a) Zero beat WWV with BFO on in receiver (use WWV quiet period); b) Turn on 100 kHz oscillator and adjust the circuit (oscillator calibration) to agree with WWV zero beat on receiver; c) Measure 100 kHz frequency on counter, adjusting the counter's time base crystal to display 100 kHz exactly.

the simplest way to do the job would be to hook up an external 100 kHz crystal and couple it to both the receiver and frequency counter. Tune the receiver to zero beat (BFO on) using WWV on 5, 10, or 15 MHz, (quiet period for zero beat), then turn on and adjust the 100 kHz crystal oscillator for a comparison zero beat.

> *"... bring your frequency counter back into calibration. Expect accuracy to 1 Hz or possibly 0.1 Hz per MHz."*

When the oscillator is adjusted to zero beat with WWV, measure its frequency on your counter. This method is now using the 100 kHz oscillator as a transfer standard. Now if there is an error on the counter (during perfect zero beat), correct it by adjusting the frequency counter time base until the counter display reads exactly 100 kHz. This should bring your frequency counter back into calibration. Expect accuracy to 1 Hz or possibly 0.1 Hz per MHz with most small counters. See Figure 3 for details.

Konrad in Palmdale, California, is a photographer and wants to know how the railroads use microwave for communications. He monitors VHF to determine when older engines and equipment are coming down the track, since he wants to photograph this older equipment. Well, Konrad, I don't believe they are using microwave directly to their mobiles and equipment. What they are doing is using the microwave system much like the telephone companies use it—for normal telephone communications, except that theirs is a closed system. This enables the railroads to process repeater communications from almost any part of the country to one of several central control points for co-ordination.

Some of these companies sell the extra channel space on their microwave systems, just like the telephone companies do. There is no way to monitor these microwave frequencies without costly demultiplexing equipment. Normal telephone microwave involves many channels, all of them operating on one microwave frequency. Large systems use from 600 to 1860 channels per microwave. A small system could be just 60 channels. Five basic 12-channel groups are combined into a "super group" to make 60 channels. Ten super groups combine to make a "master group" of 600 channels stacked in a frequency progression, each one of them carrying on multiple operations on at the same time without interference. See Figure 4 for a typical multiplexing scheme that feeds one microwave transmitter as its baseband signal.

Because of this multiplexing scheme, it would take expensive equipment to demodulate the microwave signal, not to mention the federal legal aspects involved. There are even state statutes that apply to police scanner operations, so check out your local laws to be aware just what is involved. If you do use a VHF scanner don't be disappointed comparing performance to commercial equipment. The commercial equipment gets its high performance from sensitivity and immunity to overload interference. Most scanners available on the market are not comparable and do overload or are desensitized in the presence of strong signals.

Frank WØNRI in Evergreen, Colorado, states that he has a hearing loss similar to mine. (He can't operate next to a blower motor on amplifiers, either.) He was very interested in the column on conduction power amplifier tubes, and is on the lookout for tubes similar to the 4CS250SRs, as he wants to convert an existing power amplifier. Let us know developments, Frank, as your project nears completion.

John K2SMZ sent me a copy of the very fine newsletter *Cheese Bits*. This is a product of the Mt. Airy "Pak rat's" VHF Club in Philadelphia, Pennsylvania. Club meetings are on the third Thursday of the month at the Southampton Free Library, 947 E. St. Rd., Southampton PA 19866. Thanks, John.

Glen, from Cleveland, Ohio, has questions about using a Solfan-type of Gunn oscillator mount with an additional 18 GHz oscillator focused into the same antenna. He is wondering what kind of switching would be needed to select either oscillator for local use. I believe that by keeping it simple, no switch would be required. Both frequency sources are mounted at the focus of the dish, and you only have to reposition the dish to focus it for each different unit. Now switching is simply the position of the dish and DC power switched to the oscillator desired.

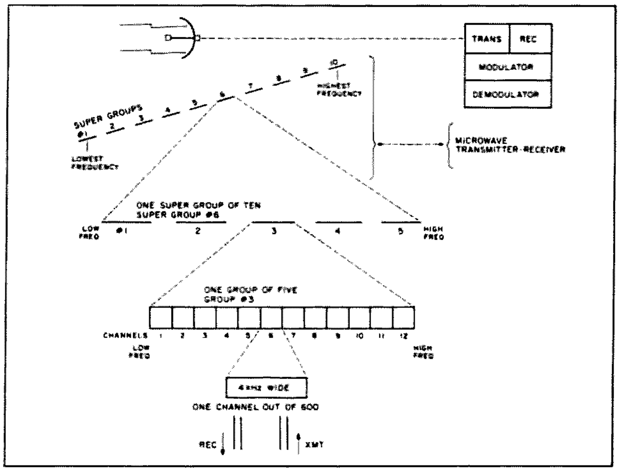


Figure 3. Frequency stacking for microwave transmission. Each group, subgroup, is modulated together by a progressively higher frequency local oscillator to stack 600 voice channels into one microwave transmitter/receiver (full duplex voice).

Larry VE2YU wants to know if the preamp board is available for the project in "10 GHz Fun," my article in the April 1990 issue. Yes, it is, and comes with the kit, as stated in the article. Except for the ferrite rods for the low frequency calibration antenna, all kits previously mentioned are available. I still have plenty of VN-10KM FETs, but the local surplus store sold all the remaining rods before I could pick up a second batch.

As always, I will be glad to answer any questions pertaining to microwave or related topics. For a prompt reply please send an SASE. 73, Chuck WB6IGP.

Number 34 on your Feedback card

NOTES FROM THE ELK

Bill Brown WB8ELK

Special ATV Issue

In this issue we highlight a facet of amateur radio that has really excited me for many years: Fast-Scan Amateur Television, commonly known as ATV. I was in high school when I found out I could actually operate my very own television station from my house. I immediately tore apart my parents' UHF tuner and modified it to tune in the two active ATV stations in town. Even though this was shortly after the first TV signal had been sent back to Earth from the Moon, I think I was more thrilled to see Dan W8PXU and Bob W8RSK waving at me on our old 1960s' TV.

Back then the hardest part was finding a source of video to transmit. Things have changed dramatically over the past few years! With the advent of inexpensive VCRs, camcorders, surplus security TV cameras and home computers, today's ATVer can choose from all kinds of video sources. With several sources of commercially available ATV equipment, you no longer have to be an electronics genius to join in the fun.

Add the dimension of sight to your amateur radio communications! Have a problem with getting a computer program to run? Maybe you need some help with troubleshooting a piece of equipment. Think of how much easier it would be to show your friend the program or your sick rig directly on his TV set!

There are many different facets of ATV operations. DXing (the world record is over 1000 miles on the 70cm band), experimenting with the latest video circuitry, showing off your latest computer programs, public service (parades, special events and emergency communications) and, of course, just sitting back watching each other hamming it up on TV! Don't wait another 20 years for the real-time videophone—it's here now in the form of ATV.

New Heights for Amateur Radio

It only takes a few rides in a private airplane or hot air balloon to get hooked on flying. Unfortunately, these opportunities are fairly rare and costly. If only there was a way to see this view more often. How about rigging up an R/C aircraft with ATV? Imagine being able to fly along with your R/C model . . . put yourself right in the cockpit and really experience the excitement of flying from the safety of your hamshack. All thrills and NO chills! This issue of *73* highlights what can be done with R/C aircraft and rockets. I've taken this idea one step further to send my ham station right on up to the edge of space with weather balloons, resulting in one whale of a ride. It's quite an experience to parachute 20 miles back to earth, all the while knowing that your feet are on solid ground!

Getting Started on ATV

The best way to get involved is to find some local ATVers to demonstrate their station setups for you. Check into the weekly ATV net on 3.871 MHz each Tuesday night between 8 and 9:30 p.m. We'll be glad to help you out. If you know of local ATV activity you may be able to tune in with just a cable-ready TV or VCR, as long as you have an outside antenna. It turns out that cable Channels 57 through 60 coincide with our ATV frequencies on the 70cm band.

The following list should help you find out more about ATV and available equipment:

ATV Publications

ATVQ (Amateur Televison Quarterly), 1545 Lee St., Suite 73, Des Plaines IL 60018. Phone: (708) 298-2269.

CQ-TV (British Amateur Television Club) Dave Lawton GOANO, "Grenehurst," Pinewood Road, High Wycombe, Bucks., England HP12 4DD. The U.S. agent for membership/subscriptions is Wyman Research Inc., R.R. #1, Box 95, Waldron IN 46182. Phone: (317) 525-6452.

SPEC-CQM Journal, P.O. Box 1002, Dubuque IA 52004-1002. Phone: (319) 557-8791.

VHF Communications (German publication that has quite a few ATV articles), UKWberichte, Jahnstr. 14, Postfach 80, D-8523 Baiersdorf, West Germany 9133 47-0. The U.S. agent is Timekit, P.O. Box 22277, Cleveland OH 44122. Phone: (813) 953-4506.

ATV Manufacturers

AEA, P.O. Box 2160, Lynnwood WA 98036. Phone: (206) 775-7373. Manufactures ATV transceiver model FSTV-430A and associated antennas.

Communications Concepts, Inc., 121 Brown St., Dayton OH 45402. Phone: (513) 426-8600. ATV downconverter kits.

North Country Radio, P.O. Box 53-A, Wykagyl Station, New Rochelle NY 10804. Phone: (914) 235-6611. Send an SASE for a catalog covering a variety of video related projects, including two ATV transmitter kits.

P.C. Electronics, 2522 Paxson Lane, Arcadia CA 91007-8537. Phone: (818) 447-4565. One of the longest-standing ATV manufacturers. They offer a large selection of ATV modules as well as complete transceivers and antennas.

T.D. Systems, 2420 Superior Dr 'B', Pantego TX 76013. Phone: (817) 861-5864. Produces a high-quality lineup of mast-mountable AM and FM ATV modules operated by a control system in the shack.

Wyman Research, Inc., R.R. #1, Box 95, Waldron IN 46182. Phone: (317) 525-6452. ATV transceivers, receive converters, transmitters, also carries a lineup of FM ATV systems.

A number of other companies offer antennas, amplifiers, and accessories suitable for ATV. With this kind of manufacturer support we may gain quite a few newcomers to ATV in the near future. Hope to SEE you real soon! 73

Number 35 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
PO Box 1079
Payson AZ 85541

Good to Excellent DX

The first two weeks of the month are expected to be very good for radio propagation on the HF bands from the early morning to the late evening hours.

The usual summer static on the lower HF bands will prevail, but in general you can expect good to excellent DX conditions on all HF bands. The last two weeks of the month, however, are likely to be disturbed, with only fair to poor DX conditions on many days.

The worst days, with the greatest ionospheric and atmospheric upsets, will occur on or around August 19–20, 25, and 30.

On August 6, the moon will be full, with a partial lunar eclipse visible from S.W. Alaska, the Pacific Ocean, Antarctica, South and East Asia, and Australasia.

As always, listen to WWV at 18 minutes after each hour for current updates on trends and conditions. The bands at this time of year will be making their transition from summer to fall conditions, and will generally be improving each day toward September. This period, of course, is the prime time for DXpeditions, so anyone interested in rare DX ought to have a ball in August. Keep a sharp lookout for unusual callsigns. 73

EASTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	—	20	20	—	—	20	20	—	—	—	—	20
ARGENTINA	15	20	20	—		—	—	—	—	10	10	15
AUSTRALIA	15	20	20	20	—	40	20	—	—	—	—	10
CANAL ZONE	15	[illegible]	[illegible]	[illegible]		20	10	10	10	10	10	15
ENGLAND	40	40	40	—		—	15	[illegible]	10	[illegible]	[illegible]	20
HAWAII	15	15	20	20	40	—	20	—	[illegible]	[illegible]	10	[illegible]
INDIA	20	—	—	—	—	—	15	15	—	—	—	
JAPAN	—	20	20	—	—	20	20	—	—	—	—	20
MEXICO	15	[illegible]	[illegible]	[illegible]		20	10	10	10	10	10	15
PHILIPPINES		—	20	—	—	20	15	10	—	—	—	15
PUERTO RICO	15	[illegible]	[illegible]	[illegible]		20	10	10	10	10	10	15
SOUTH AFRICA	20	—	20	20		—		—	10	10	15	15
U S S R	—	—	20	20	20	—		15	15	—	20	20
WEST COAST	20	[illegible]	[illegible]	40	40	40	10	10	10	10	10	15

CENTRAL UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	[illegible]	20	20	20		—	20	—	—	—	15	[illegible]
ARGENTINA	15	15	20	20		—	—	10	—	10	10	10
AUSTRALIA	10	15	20	20	20	[illegible]	20	20	—	15	10	10
CANAL ZONE	15	[illegible]	[illegible]	[illegible]		—	10	10	10	10	10	10
ENGLAND	—	—	—	—		—	—	15	[illegible]	15	20	20
HAWAII	[illegible]	15	20	[illegible]		[illegible]	[illegible]	—		10	10	10
INDIA	15	20	—	—		—	20	15	—	—	—	—
JAPAN	[illegible]	20	20	20		—	20	—		—	15	[illegible]
MEXICO	15	[illegible]	[illegible]	[illegible]		—	10	10	10	10	10	10
PHILIPPINES	[illegible]	[illegible]	20	—	—	—	20	15	15	—	—	[illegible]
PUERTO RICO	15	[illegible]	[illegible]	[illegible]	—	—	10	10	10	10	10	10
SOUTH AFRICA	—	—	20	—		—		—	10	10	15	20
U S S R	—	—	20	—	—	—	—	15	15	20	20	20

WESTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	[illegible]	—	20	20	20	20	20	—	—	—	[illegible]
ARGENTINA	10	15	20	20	20	—	—	—	10	—	10	[illegible]
AUSTRALIA	10	10	15	20	20		40	20	20		10	10
CANAL ZONE	15	15	[illegible]	[illegible]	20		—	[illegible]	10	10	10	10
ENGLAND		—		—		—		—	15	15	20	20
HAWAII	10	15	15	20	[illegible]	40	40	—	15	15	—	10
INDIA	[illegible]	[illegible]	20	—	—	—	—	[illegible]	[illegible]		—	
JAPAN	10	—		20	20	20	[illegible]	20		—		
MEXICO	15	15	[illegible]	[illegible]	20	—			10	10	10	10
PHILIPPINES	15	—		20	20	20	20	20	20	20	20	15
PUERTO RICO	15	15	[illegible]	[illegible]	20	—		[illegible]	10	10	10	10
SOUTH AFRICA	20	20	20	20		—		—	10	10	15	20
U S S R	—		—	[illegible]	[illegible]		—	[illegible]		[illegible]	20	20
EAST COAST	20	[illegible]	[illegible]	40	40	40	10	10	10	10	10	15

Note: (1) Possible on some days.
Use 10 for 10 & 12 meter bands, use 15 for 15 & 17 meter bands, use 40 for 30 & 40 meter bands. Where 2 bands are shown, try both. This data is for the highest possible frequency to be used on a given path (MUF).

AUGUST

SUN	MON	TUE	WED	THU	FRI	SAT
			1 G	2 G	3 G	4 G
5 G	6 G	7 G	8 G	9 G	10 G	11 G
12 G	13 G	14 G	15 G	16 G-F	17 F-P	18 P
19 P	20 P	21 P	22 P-F	23 F	24 F-P	25 F-P
26 F-G	27 G-F	28 F-P	29 P	30 P	31 P	

73 AMATEUR RADIO

International Edition

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2m Endfed

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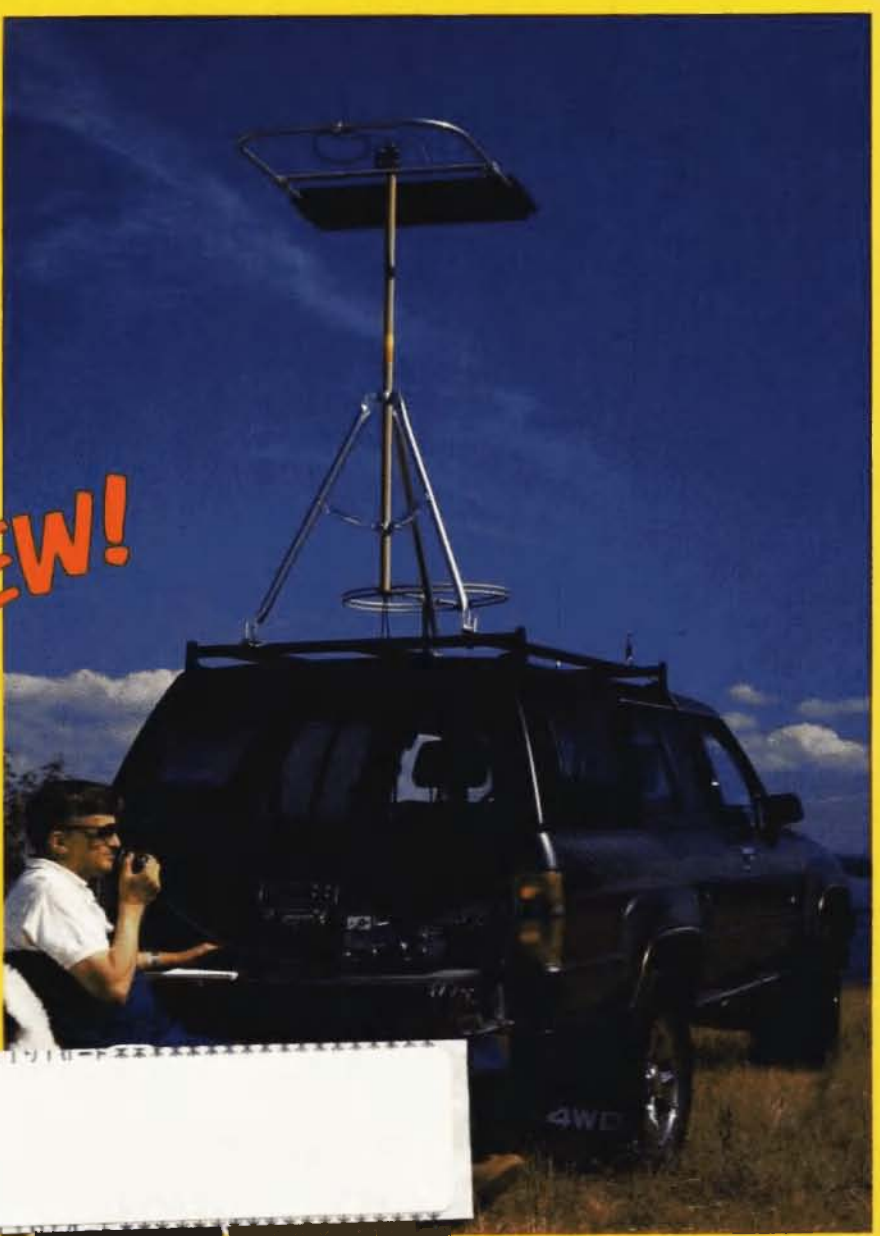

10
0 74820 08725 1

LETTERS

From the Hamshack

WR0W: I have been a generally inactive ham for 25+ years because hams were... well, boring. With retirement I decided to become active. Now I find that some hams are malicious, too. Your editorials are right on. Keep up the good work.

Kevin Thomas, Louisville KY: I hope I'm not the last of a dying breed. I've recently begun taking a course to help me pass the test for my Novice ticket. I've spent the last 6½ weeks steeped in the amateur radio world. Guess what! I am excited about what I see going on. I made the trip to Dayton for the Hamvention. WOW!!! The field is wide open. You are able to go into any field of expertise you wish. At this time I'm actually excited about code. It is fun. With a little patience and practice it can be mastered. I'm less than two weeks from test time so I hope that I will soon be among the ranks of the hams.

Rod Templeton, Coquitlam, B.C. After the recent Field Day festivities were over, I felt compelled to write and let you know that some hams still like to introduce new people to the hobby.

I had been trying to find out how to get into ham classes without much success. Then I drove over to the park where the Burnaby ARC had set up for Field Day. I walked around, just having a look for a while, then two gentlemen asked me if I was with the group. I told them I had just come down for a look. One ham, John VE7JPW, actually sat down and asked me what I knew about Field Day and hamming in general. Then he invited me down to the club to see what the meetings were like, and told me about the classes (which always filled up quickly!).

I participated in the contest, helping log stations on 40m for a couple of hours. A lot of people asked me if I was interested in becoming a ham, making sure I knew about the meetings. Everyone I talked to was great. Nobody tried to dazzle anybody with jargon. I'll start classes in October. I'd like to thank the Burnaby Club, especially VE7JKJ, VE7JPW, and VE7MIC for putting up with me while I logged the contest. See you on the air someday.

Phillip Isenberg KB4CPB, Winston-Salem NC: "Everybody" knows what a yagi is. We all understand what is meant by QRT, DX, QSO, RTTY, and packet. But what about the curious person who has heard about "ham" radio and decides to pick up one of our magazines at a newsstand? He or she might as well pick up a foreign newspaper.

Whether the use of jargon and abbreviations is an act of snobbishness on our part or just an unconscious act, most of what we say concerning ham radio goes over the heads of a lot of people. We hear or read "hamspeak" and, like lemmings, we follow along and encourage others to use our jargon, too.

"Hamspeak" annoys and confuses people who would like to learn something about ham radio but are repulsed at every juncture by our incomprehensible and easily misunderstood language. Sure, they can learn the hard way, the way we learned. Pay their dues, earn their stripes, and someday be a ham, too. But for everyone who achieves hamdom this way, 100 or 1000 others listen to our jargon and run the other way.

So who needs them, right?

Do you have all the club members you want? Do you dealers have all the customers you need? Do you magazines have all the subscribers you want and need to stay in business? Chances are the answer to these questions is a resounding "No!"

Unless we clean up our act and go out of our way to help the beginner learn the ropes and give him or her a chance to learn from us without having to master "hamspeak" first, we may someday soon be a very small society of ex-hams.

Bob Kozlarek WA2SQQ, Elmwood Park NJ: We all have some talent or product to offer our fellow hams. I got the idea to compile every modification I could find on the SB-220 and offer it at a modest price. My wife laughed and said, "Who would ever buy it?" I placed ads in all three of the amateur publications and sat back. All of a sudden the letters came—dozens of them. That was four years ago, and I'm still going strong—thanks to *73's* "Barter 'n' Buy" column. I have consistently received the best response from "BNB" as compared to other publications. Don't be afraid, sit up and give your idea a try. Donna DiRusso and the staff at *73* make placing your "BNB" ad child's play.

Ray Kohler W9OBD, Sycamore IL: We worry about the loss of our amateur radio frequencies, which signals the end of ham radio. This is probably the furthest thing from the truth as far as the death knoll for the hobby... the end will be caused by the inconsiderate appliance operators who have licenses now. Let me give you an example, which is not a single instance. We have been giving a lot of publicity to SAREX, DOVE, and hams in the space program. This is a very important PR tool as well as a means to get the young people interested in our hobby. The frequencies for the shuttle audio have been published in all the magazines and are general knowledge to any active ham.

On Saturday April 28, 1990, I had a group of people over to listen to shuttle audio. As we listened on 14.295 MHz there was an offending carrier just in the passband. Tuning up just slightly we could hear a QSO going on. About that time another station came on and asked the two hams having the QSO if they would mind moving up a couple of kHz due to the shuttle audio interference. You can guess what happened next.

The gentleman (ham) who asked them to move was very low key and courteous, which took a great deal of patience on his part. The band was not even crowded, but that didn't seem to matter to the two that were in QSO. I didn't get any of the callsigns or I would have sent all concerned a letter, one of thanks, and two to the offending parties to try to wake them up to the fact that their types are killing ham radio with their self-serving attitudes.

I'm one of the first to speak out against specific frequency use, but this (shuttle frequency) is an exception and only happens two or three times a year, and then only for a few days at a time.

What happens to the young folks who hear this in the classroom? Do we want or need new blood to keep the hobby alive???? Would *you* want to join a hobby that shows this kind of attitude? Remember, there is influence and power in numbers. Without these numbers we may not have a vote in our destiny...

Vernon Erle Ikeda, Pierrefonds, Quebec: I was really disappointed with the cover of the July issue. It gives people the wrong impression of amateur radio. I thought that the cover belonged on a mercenary magazine, not on the cover of *73*. Otherwise the issue was great, with DFing as the main article. I just might try it out.

The July cover was meant as a tongue-in-cheek look at Foxhunting, hence the Hambo theme. No, you don't need a gun to locate hidden transmitters. In fact, we received a number of positive comments about the cover at the recent Dallas HAMCOM show. Give DFing a try. I think you'll find it to be a great challenge and a lot of fun.—Bill WB8ELK ... I'm sure glad ELK season hasn't started yet!

Terry Coker AA6LG, Cucamonga CA: I recently read in a bulletin on a local packet BBS about a ham not knowing how to deal with an operator he recently discovered was a bootlegger.

This brought to memory a bootlegger I found out about, named Jeff. He was very active on an L.A. repeater. He had great operating technique and was very intelligent and a good conversationalist. It never crossed my mind he might be bogus.

Jeff made claims to us at coffee meets that certain jammers and bootleggers plaguing the repeater were out to get him. He was, after all, the repeater's most active signal direction finder, and claimed to find several jammers.

Jeff threw a dinner at his place for users of the repeater that was well-attended. He went to repeater breakfasts and meets for coffee in the early morning hours. He was considered one of the regulars and a "great guy." He used lots of the equipment at the repeater's Field Day site.

It was not until a few months ago when I ran across the real ham with the callsign Jeff was using that I realized Jeff was a fake. What an eye-opener! A check of the callbook confirmed the situation.

Suddenly Jeff dropped out of sight—I wonder why?

Jeff fingered several good hams as being jammers. He would drop their callsigns at the coffee stops. His nerve still amazes me. He had the intelligence to easily get a license. I think he got a rush knowing he had everyone fooled.

Martha M. Lostrom KA1UUO, Saco ME: Playing the mandolin... and aiming for the Tech and General ham licenses. Do these two things to together? Well, I hope so...

I just picked up the July issue. Read the letters and your *[Wayne's]* editorial. Then turned to the ads. I'm faxing my order for your super code tapes—if KA1COJ can do it (July "Letters"), then I can too! After all, I just bought a mandolin with the belief that I can learn to play it. I am in the mood to be inspired.

Will it be easier to learn to play the mandolin, or learn the 13 wpm code on Wayne's tapes? Who knows for sure. But I'm betting that the code is going to be easier.

Newport Yachting Center in Rhode Island was looking for some new attraction for the Newport International Powerboat Show September 20–23, and I said, hey, you want a ham booth with amateurs showing off. They said, OK. We'll give you a 10 x 10 booth (tent) with electricity and all the tables and chairs you want, no charge. OK, I said, put "us" on the schedule. I'm on the hunt for "us." Wouldn't a foxhunt in Newport or a 2m demo be great? I'm still stuck on 10m—hence the need to climb the higher mountain and become a General.

Any hams you know of who would love to get a free pass to the boat show, and turn on an electronics-receptive audience, many of whom are keenly interested in marine single-sideband, PLEASE give me a steer.

Heck, the code is a lot easier than the mandolin. You should have your General in a few days—doing about ten minutes a day—if you do it my way!

The mandolin is a great instrument—beats the viola all to hell. Of course, I'm a bluegrass fan, so I hear a lot of good mandolin pick'n. Once you get good at it, try the banjo too—another great instrument.

The boat show sounds great. I'll pass your fax on to Bill and see what he can muster.—Wayne

Dave Rust WA0LKF, Rogersville MO: I enjoyed reading your "Never Say Die" in the June issue, and couldn't agree with you more.

It seems as though our hobby will never be what it once was, due to the advances in technology and different interests for everyone to pursue. Ham radio was at one time a place where a newcomer couldn't help but learn something, due to the very nature of the testing.

While I agree code is like driving down the four-lane highway in a one-horse buggy, I still take pride in knowing after all these years I can recognize my own call on CW. Some of us remember when we improved ham radio around 1966 with the new idea called Incentive Licensing. It was then designed as I recall with the help of the ARRL to bring gigantic new numbers to our ranks. Apparently they didn't show up in the numbers someone expected, as we have been in a recruitment program ever since.

Now here we go again with a new codeless class of license. I have no objection to a codeless class; however, if the entry level licensee can only have voice on 220 MHz up, the newcomer is going to be mighty lonesome. He will probably wish he had taken up basket weaving.

Our hobby has rapidly become, thanks to the memorizing of the answers, a way to determine when the wife will be there with our lunch, tell whether she still loves you, how her day went.... I am still taken back when an operator asks another operator to "Come back and give me your personal again, I missed it."

Now, I don't profess to be the perfect operator. I have not stayed current with the state of the art. I have been known to say damn or hell on occasion, but I don't get on the air and ask someone to come by and help me turn my HF rig on, I don't know how, make it in the next thirty minutes if you can, I have to go teach a Novice class here shortly.

It's easy to see that chasing down every old tired CBer and trying to give them a Novice license wasn't the answer. If we are going to improve and preserve our future, I think we need a test that is a test. It does very little good to memorize a few questions, pass an Extra Class test, become the local expert, and tell the world how much you know with a conversation like this: "Boy, Jake, you gotta beautiful signal in here, your'a lighting all my lights here in the old rig, and you're 50 miles away and I'm just receiving you on an 18-inch spike in the back of the old rig." All that time the full scale signal is coming from a repeater running 30 or 40 watts on a 200-foot antenna only five miles away.

I say let's have tests that are practical, one that tests ability, do some soldering, how to set up a station, cut an inverted-V, do some troubleshooting, etc. We have Volunteer Examiner testing practically on a one-on-one basis, so let it be involved as to what the applicant knows and can do. It will certainly be no extra cost to the Fox Charlie Charlie.

We have discovered that you don't improve the quality by lowering the standards. We simply can no longer give away the store and hope it works out.

SEPTEMBER 1990
Issue #360

73 AMATEUR RADIO®

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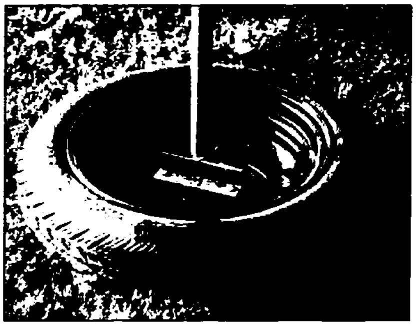

A spare mount . . . see page 44.

DEPARTMENTS

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NEVER SAY DIE

Wayne Green W2NSD/1

Mortality

When I started *73*, thirty years ago, I gave little thought to the future. If someone had asked if the magazine would be around in thirty years, I'd have probably said sure, if I'm still around.

But with every passing year I'm more and more aware of how easy it is to be blown away. Somehow I've managed to miss getting killed in accidents. . .have not contracted any of the almost unlimited number of terminal illnesses. . .no brain tumors or fatal heart attacks. It's like being on a winning streak in gambling, with the dice coming up sevens every day. Yet I know that one day they'll come up box cars or snake eyes.

For 68 I'm weathering reasonably well. The doctors tell me I'm more like someone ten years or more younger. I'm still an active skier and scuba diver and I walk a lot.

But I'm well aware of the other side of the ledger. My body may be doing well, but it's wearing out in many ways. I can't read without my glasses. Much of my hair is gone. My teeth are gone, although that's more due to my poor choice of dentists than aging.

Glasses are a royal pain. It means making sure any shirt I buy has a pocket. It means going back to get 'em if I start off anywhere without 'em. It means having a glasses cloth in my pocket to keep 'em clean. It means snapping a lens back in when one falls out. It means taking 'em off for pictures. . .partly for vanity, but more because I use automatic darkening glasses and they usually look black in pictures.

My father and his father had plenty of hair, but nooo, I had to take after my mother's father, who went mostly bald when he was in his 20s. Well, at least I made it to my 50s before my hair left. Now I have more hair on my chest than my head. My second wife wanted me to wear a wig to look younger. I tried one for a while, but it looked dumb. And besides, I've never bowed much to peer pressure. That's probably what kept me from ever smoking. I didn't have a big need to have everyone think I was cool.

The teeth are a real serious nuisance. Last winter I had four posts implanted in my lower jaw. It's supposed to take about six months for the bone to grow around them, so sometime soon the dentist will be cutting my gums open and plugging a lower plate into the posts. I'm sure looking forward to that. More pain.

The up side is that I won't be in agony every time I eat. Right now my lower plate keeps my gums raw from the abrasion. . .and every time I eat anything hard like nuts or chips, the sharp pieces migrate immediately under the teeth and hurt like hell.

Then there's my ears. They're doing fairly well. At least I'm not hard of hearing like my father and his father. But I do have tinitus. . .a ringing on the ears. . .probably a reminder of standing near the 12" guns on a heavy cruiser during gunnery practice. . .or perhaps of high decibel demonstrating hi-fi speakers at audio shows back in the '50s.

Then there's that pain in my left foot, a reminder of when I broke a small bone while I was in the Navy . . . which wasn't set right. The Navy doctor was a ham, naturally, so I've had a slight limp and pains ever since. The bright side was that I got a lousy 10% disability payment for a few years.

More serious was a close call with cancer of the colon a couple years ago. That was a near miss where my doctor claimed my laptop computer saved my life.

A few years back I developed high blood pressure. My doctor prescribed Dyazide for it and my blood pressure went down to normal just fine. The side effects are uncomfortable though. Like a constant post nasal drip which has given me a sore throat for the last several years and made it so I can no longer sing. And a swollen gland behind my left ear which makes it painful to wear my glasses. And a dizziness when I wake up. . .I almost fall down now and then. And frequent cramps in my toes and legs. And the darndest bruising I've ever seen. When the dentist did my implants my whole jaw turned purple. He said he'd never seen anything like it. I banged the calf of my leg while diving and my whole leg turned purple for weeks.

Oh yes, Dyazide also seems to cause gout. I experienced intense pain in both big toes after being on my feet for four days at a business show, so the doc put me on Benamid to stop it. Heaven knows what side effects I'm getting from the Benamid.

It seems to me that this tendency to bruise easily is indicative of weakened blood vessels and that probably means I'm a good candidate for a stroke. My mother's mother stroked. . .as did her mother.

My father died at 87 from smoking. . .emphysema and a weak heart. My mother (also at 87) from Alzheimer's. You can bet I'm watching for any signs of short-term memory loss. If I see any signs of that I'll apply for my Silent Key certificate, move right along to the next world and skip the years of misery.

My father's father died of suicide when he got fed up with his bitchy third wife and my Uncle George got him into a stupid business deal which wiped out his life's savings. It was probably a good decision.

I've had a pretty good life. Oh, I've had some world class traumas . . .most of 'em involved my first wife . . .and a few my second. I've accomplished a lot. . . more than most people do. But I've still got a lot of goals which I'm uniquely equipped to tackle.

Like getting the ARRL to get amateur radio growing again so America will at least have a chance at recovering our electronic industries. And revamping our lousy American educational system. And writing a book on how the mind works and how to fix it. And building sales for independent record companies. And getting more people to enjoy more kinds of music. Things like that.

It's fun. Sherry and I were recently in Sedalia (MO) for a ragtime music festival. Sedalia is where Scott Joplin got ragtime music started. We were at a Scott Joplin Club reception and sitting at a table with two men. One turned out to be a fan of *CD Review* and my editorials in that magazine. The other was an old Wayne Green fan from my computer magazine editorial days. Be quiet, my hungry ego.

Other pains. My left hand has been giving me trouble. It started a few weeks ago with an occasional sharp shooting pain when I'd pick something up with it. Then one day it hurt terribly to pick up even a book or open a door. My middle two fingers ache much of the time now, but the sharp pains have subsided.

Then there's an ache in my left leg. Not a strong one, but enough to let me know that something isn't working just right.

Looking at it pragmatically I've got probably ten years left to harangue you. . .twenty tops. Heck, I've already outlived most of my critics. I'll be 68 on September 3rd, marking my 52nd year of hamming.

I started *73* thirty years ago because I believed it was needed. It's here today for the same reason. It's been fun helping make things happen. . .like NBFM, RTTY, SSB, SSTV, repeaters, cellular radio, computers, compact discs . . .stuff like that. I've particularly enjoyed encouraging thousands of readers to become entrepreneurs and make money. Lotsa money.

It's been fun starting new publications and other associated businesses. I've tried to make it possible for young, untrained people to come to work for me and build their skills. Some have gone on to be very successful. A few are still with me. Several for over ten years.

There's always something new going on. We've just started a 900 number so my *CD Review* readers can call in (at their expense) and let me know what they think. They can also check out the music we've reviewed. And there's my anti-longbox campaign, my recent discovery and marketing of balonium, our Astounding Sounds 2000-mile caravan tour, a couple of new publications, more record releases. . .and let's see, what was that about a possible diving expedition to the Galapagos? But first I have to get my mail answered. . .and there are editorials for around 20 publications to write. Sigh.

The Ham Market

Maybe you've noticed that the ham magazines are thinner today than they used to be. Maybe you noticed that *Ham Radio* magazine blew away recently. Maybe you've heard rumors that another ham rag may be in trouble. If you have noticed these things, maybe you've wondered. Maybe not.

Near's I can figure, today's ham market is running about 25% of what it was 25 years ago, when the ARRL dropped their Incentive Licensing bomb on their members. We had a rushette when two meters got repeaterized twenty years ago, building ham sales to about double today's ham market for a short while. But it cooled off again.

Old-timers will remember when we had a dozen or so large companies making ham equipment. Like Swan, Gonset, B&W, Collins, Hallicrafters, Hammarlund, National, Central Electronics, Lakeshore, Harvey-Wells, Galaxy, Clegg, and Drake. Heath is still with us, but I've heard they may finally be giving up on the ham market.

So what's our future look like? Are we going to see fewer and fewer manufacturers as we old-timers die and our hobby shrinks? There *is* an alternative, but only if you swing into action.

Yes, of course every one of us should take some responsibility for our hobby. We should be out there Elmering youngsters, starting radio clubs in our schools, and sending PR releases to our local newspapers. But hey, that's a lot of work for old-timers like us. If we had any youngsters we could leave the job to them, but we cut off our youngster input 25 years ago, so we don't got 'em any more.

What *can* we do? Throw the rascals out of the ARRL who've made or allowed this to happen. Take aim at the League fall elections and don't re-elect even one of the present directors. Ban Old League Directors. . .a BOLD move.

You've got to move fast to oust those who come up for re-election this fall. You've got more time to round up some hams who are more interested in our hobby and its survival than they are in the incredible prestige and perks of being a director. If you start now with this project in your radio club, by next year we could have the first real election of directors in the history of the League.

The platform I'd look for in a director would be a pledge to have the League set up two new departments, each with a staff and a budget. One would be dedicated to cleaning up our bands. The other to rebuilding our ranks. Are those goals out of line for our only national organization? Those should be their first responsibilities, not their last.

One of my business axioms is almost worth thinking about. I know it's heresy in America today and it harks back to kinder, gentler times, but here it is: "The customer may not always be totally wrong."

Are you, as a ham, satisfied with the League's performance in resolving repeater problems, the 14,313 mess, net jamming, bad language, DX pileups and such? Are you a completely happy customer as a League member?

Are you satisfied that millions of American kids have never even heard of our fantastic hobby? Has the loss of some two million engineers, technicians and scientists which amateur radio would have contributed, had it con-

continued on p. 76

QRX . . .

EDITED BY LINDA RENEAU KA1UKM

Four Balloons Launched!

On July 4 the Amateur Radio Experimenters group in Greenville, South Carolina, launched a balloon carrying several radio experiments from a site just east of Greenville. The group has been working with the Roper Mountain Science Center to involve the local school kids in amateur radio, and a number of the kids attended the launch.

The K4SAO/N4LTA payload consisted of three transmitters: 144.34 MHz FM with a voice ID (100 mW), 145.935 MHz CW (10 mW), and 50.086 MHz CW relaying temperature telemetry. At the top altitude of 94,000 feet, the signals were heard over 350 miles away in Ohio by WB8URI in Columbus and WB8YIF in Little Hocking. Stations in North and South Carolina, Georgia, and Tennessee also heard the transmissions. They believe the package splashed down 35 miles to the west in Lake Toxaway. It was not recovered.

On July 7, two separate balloons went up in separate locations. Mike Bogard KDØFW launched an ATV transmitter with a live color TV camera from east of Kansas City, Missouri. In addition he had a 144.34 MHz FM transmitter with digitized voice ID and a 52.525 MHz FM beacon. Stations as far away as Champaign, Illinois, received the signals (350 miles). After attaining 85,000 feet, it parachuted back to land 18 miles northeast of the launch site. The package was recovered in short order by the many participating foxhunt teams.

Bill WB8ELK launched a microballoon from *73* headquarters that same morning from Hancock, New Hampshire. The 1 milliwatt transmitter on 145.947 MHz sent out altitude telemetry via a Morse code altimeter. Even with the extremely low power level, the signal was heard over most of New England with reception as far away as Ottawa, Canada (280 miles). A small sounding-balloon was used to achieve a 30,000 feet altitude. After the balloon burst, the package parachuted down and disappeared in the Boston area. Meanwhile, near the Boston Harbor lighthouse . . . Mike Cox was very surprised to see a package attached to a bright orange parachute descend from the sky and splash into the ocean just 30 feet in front of his boat. Thinking that millions of dollars had just fallen from the heavens, he eagerly fished the balloon payload out of the water (the Catch of the Day). Although somewhat concerned when the package started beeping at him, he decided not to throw it back and instead gave us a call. Not quite a million bucks, but he did receive a $50 reward!

The K4BV Sky Beacon 1 flight occurred on July 15 from the Daytona Beach, Florida, area. The well-attended HF net on 7.155 MHz was run just like a NASA space launch complete with updates from their Mission Control at the launch site. The payload consisted of an ATV transmitter on 434 MHz and a 1-watt, 2-meter FM beacon on 144.34 MHz, sending down a tone sequence indicating altitude, in/out temperatures, and battery voltage. Unfortunately, a small hole developed in the balloon just before liftoff which caused it to rip apart at 2600 feet. After a brief five-minute flight, the payload landed in woods 2.5 miles away and was recovered by the chase team. At least now the chase team has a successful recovery to their credit. They plan another flight to 100,000 feet in about six weeks.

More on Spread Spectrum

In 1940 Hedwig Klesler patented an anti-jamming radio and gave it to the US government as her contribution to the war effort. Three years earlier, in 1937, she had fled Austria out of her dislike for the Nazis and Hitler.

She believed the frequency hopping technology she had thought up would keep radio controlled torpedoes from being intercepted or jammed. The technology was simple: A seemingly random series of radio signals, hopping from frequency to frequency at split-second intervals, would be picked up by a synchronized receiver. But the government didn't see the value of the technology and didn't use it in World War II.

In 1957 Sylvania independently developed the same concept, and in 1962 spread spectrum was used during the blockade of Cuba. Now it's the principal means of ensuring secure military communications. Kiesler's patent expired without her ever receiving a cent in royalties.

Hedwig Kiesler, whose stage as an actress was Hedy Lamarr, developed spread spectrum with George Antheil, an American composer. Antheil, who credits the idea solely to Lamarr, refined the synchronization scheme based on the operation of a player piano. The number of frequencies proposed in the patent—88—matches the number of keys on the piano, and specifies the use of slotted piano rolls to synchronize the jumps in frequency in the transmitter and receiver. TNX *Squelch Tales* and *Forbes.*

Soviet QSOs and QSLing

Due to a personal interest in improving the quality of his QSOs with Soviet hams and enhancing US-Soviet relations, W6HJK has compiled a 20-page syllabus of Russian words and phrases for QSOs. He includes suggestions for addressing mail, and a 90-minute audio cassette to help with pronunciation. For more information, contact Russian Phrases for Amateur Radio, Len Traubman W6HJK, 1448 Cedarwood Drive, San Mateo CA 94403. Tel. (415) 574-8303. FAX (415) 573-1217.

In late 1988 a new world opened for Soviet amateur radio operators, when they received permission to send and receive QSL cards direct. In last February's issue of the Soviet magazine *"Radio"*, as translated by Dexter Anderson W4KM, G. Chilyants UY5XE advises Soviet hams on "how to make use of the right to give one's personal address over the air": "Give your address only when asked to do so by the other station, or after he has given you his; avoid giving your address when working DX stations and expeditions, as your information won't be noted in the log anyhow." In addition: "It's not ethical to indicate the need for IRCs, much less the number of IRCs needed. These things will be determined by the other station. If there are no enclosures in the envelope sent to you, send your QSL via the bureau; if one IRC is enclosed, send your QSL by direct surface mail; if two IRCs are enclosed, send your QSL by direct airmail." TNX *The Parking Ticket* and *The ARRL Letter.*

New from Great Britain

Now there's a magazine for fans of classic, old-time radio— *Radio Bygones*. It caters to the many hams "who wish to preserve and propagate the real glories of older wireless equipment." Recently, many people have realized that these older tube sets are real pieces of furniture. They're also extremely efficient and reliable. Older tube transmitters and receivers are now collectables, getting high prices in private sales and antique shows.

A few of the main features from the June/July issue include "Radio & TV Interference Work in the 1950s," "The First Airborne Radio Telephony," "Wireless Set No. 38," "The Vintage Wireless Museum," and "Coast Radio Stations—the First Sixty Years".

Last June *Radio Bygones* celebrated its first anniversary. For subscription information, write Geoff Arnold G3GSR, *Radio Bygones,* 8A Corfe View Road, Corfe Mullen, Wimborne, Dorset BH21 3LZ, England. TNX *Richard Q. Marris G2BZQ.*

More Ham Astronauts

Four astronauts with ham tickets will be flying on STS-37, still scheduled for this November, Rich Ensign announced at the Dallas HamCom 3 Convention last June. Both the mission commander and the YL astronaut on board have joined the ranks of amateur radio operators. The ham astronauts on STS-37 are Ken Cameron KB5AWP (now a General Class operator), Jay Apt N5QWL, Linda Godwin, and Steve Nagle. Congratulations to the crew of STS-37!

The hydrogen leak on the *Columbia* has been fixed. The earliest possible launch date for STS-35 could be in late August or mid-September, according to the information we have at the time of this writing in late July. TNX *Nashua ARC Bulletin* and *Gil Carmen WA5NOM at JSC.*

Quick and Easy Field-Strength Meter

Home-brewing can be simple!

by Ray Kent KM4KT

I am one of a dying breed—someone who can be found in the wee hours of the morning, hunkered down over the test bench, letting out expletives when the smoke test actually results in copious clouds of acrid smoke. You may be part of this breed, or you may be one of the new breed that spends those late hours staring at a CRT, glued to a keyboard while chasing that elusive bug in your latest program. Whatever your chosen specialty, sooner or later you are going to want some device or gadget that you either can't find or can't afford. The latter is my biggest problem. Prices these days are ridiculous!

The only thing that concerns me more than the high cost of radio today is the lack of growth of appliance operators. I'm amazed that there aren't more technical discussions among the younger operators. Doesn't anyone build his or her own antenna anymore? The smell of hot solder and rosin has an almost hypnotic effect on me, or so my XYL says. Just thinking about taking some of the contents of one of my junk boxes and building some useful piece of equipment gets my blood to racing. I can't seem to get nearly as excited about cutting the grass or taking out the garbage. Crafting something with your hands is a head trip all its own. I'm not talking about a kit, I'm talking about rolling your own project. So dig out that soldering iron, find out where your XYL hid your long-nosed pliers and get ready to have some fun like you did before you got too busy with the other things in life.

Dig down in the bottom of your closet and find that old junk box. If you don't have one, don't worry. All the parts needed can be found at your local Radio Shack, or even at a local repair shop. Most repair shops will help you out in a bind. Remember that a resistor is a resistor is a resistor. A ¼-watt one is specified on the "Parts List," but a ½-watt, or even a 1-watt one will work just fine. The box for the meter can be a new plastic one or almost anything you have on hand. I once built an FSM for a friend that was put in one of those plastic eggs that women's pantyhose comes in. Use your imagination.

Before you say it, I already know that you can buy a commercially-built FSM for under $20. Chicken feed, right? The whole point to this exercise is to get you to build something for yourself that you can use, and to demonstrate how easy home-brewing can be. Call it a confidence builder, if you want. I don't care. I want you to enjoy getting back to the basics and having fun. That's what a hobby is for. Right?

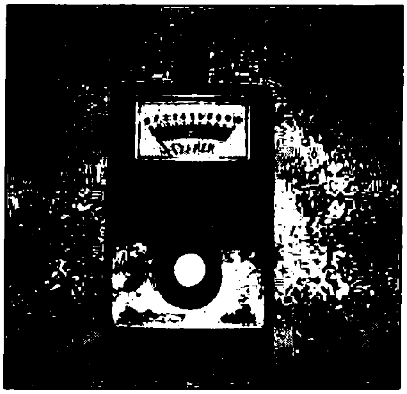


Photo A. The completed FSM.

The circuit in Figure 1 shows how simple the FSM is to build. RF is coupled to D1 and D2, which are configured as a voltage doubler. The developed voltage is seen across the resistors R1 and R2. R2 is the sensitivity control. Simple? You bet. So let's get started.

Parts List

2	0.001 µF 50 volt cer disc cap
2	1N34A germanium diodes
1	¼-watt composition resistor, 4.7kΩ
1	Potentiometer, 10k Ω
1	Binding post
1	100 µA meter movement
	Plastic box, perf board, hookup wire, etc.

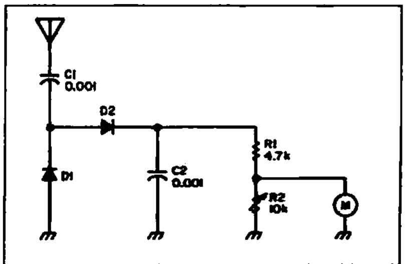


Figure 1. Circuit for the field-strength meter.

Putting the FSM Together

The most expensive part of the whole project is the meter movement. I got mine from Delta Electronics in Atlanta a few years back. Any value of meter from 50 µA to 1 mA will work. The diodes D1 and D2 are general purpose germanium point contact diodes. 1N34As or 1N60s would be just fine. C1 and C2 are 50-volt ceramic disc capacitors. I got mine in a grab bag at a hamfest. R1 is ¼ watt and R2 is a 10k ohm pot from my junk box. I used a 2" x 3" x 1½" plastic box from whereabouts unknown. The size of the box will be determined by the size of the meter that you use.

I mounted all the components on a small piece of perfboard, then mounted the perfboard to the three solder lugs on the potentiometer R2. Next, mount the potentiometer in the hole cut for it in the box. Then connect the binding post to C1 with a small length of hookup wire and connect the meter to the board. That's about all there is to it. Use your imagination to work out your own component mounting schemes. A word of caution: Don't forget to heat-sink the diodes' leads during soldering. Excessive heat can ruin them.

If you want to go to the extra trouble of making a printed circuit board, go ahead. Personally, I thought it was too much trouble for this particular project.

Testing the Meter

Testing is as simple as building the FSM. Just connect a short piece of stiff wire to the binding post and rotate the sensitivity control as you apply a signal to your antenna. It is a good idea to always start with the control all the way to the left to keep the needle from slamming into the stops. While the FSM only gives an indication of relative field strength, it will allow you to check for front-to-back ratio of beam antennas and to make a comparative analysis of different antennas. Get back into building and have fun. ■

Number 5 on your Feedback card

73 Review

by Joe Holman KA7LDN and Garth Hitchens KG7GA

The IsoLoop™ HF Antenna

Small, efficient and portable.

Advanced Electronic Applications, Inc.
PO Box 2160
2006-196th Street
Lynnwood WA 98036-0918
Tel. (206) 775-7373
Price Class: $350

If you enjoy portable HF operation, need an antenna that can be quickly set up for emergency situations, or just plain live in an apartment or tight space that doesn't allow large antennas, AEA might have the answer for you. Their IsoLoop antenna is a 32-inch-square tuned loop antenna designed to operate from 14 MHz to 30 MHz. It's compact enough to be placed in small areas, such as your attic or your outside deck. We operated with the antenna in an attic, bedroom, radio room, on top of a building, on a deck, and on the ground (mounted on a 6-foot mast).

You can mount the IsoLoop either vertically or horizontally. We had good results working DX from the Seattle area when the IsoLoop in the antenna was mounted in the horizontal plane. We worked New Zealand, Argentina, the USSR, and many other countries. When the IsoLoop was mounted in the vertical plane we worked Japan, Australia, the UK, and other countries. The radiation characteristics of the antenna are quite different between the two orientations.

Documentation

AEA provides a 16-page manual with the IsoLoop. The manual begins with a description of the features, theory of operation, and the specifications of the antenna.

Most of the manual is dedicated to assembling, mounting, and tuning the antenna. It includes three separate diagrams that are drawn very well and labeled so that any amateur can identify the parts.

The manual also provides four radiation field patterns corresponding to how you have the antenna mounted. One shows the radiation pattern if the antenna is mounted vertically; the latter three show radiation patterns if the antenna is mounted horizontally at half-wave length, quarter-wave length, or close to the ground. At the end of the manual there is a schematic diagram and a parts pictorial of the LC-1, plus the wire pinouts for the LC-1 Loop Controller.

Quality of Construction

The overall construction of the IsoLoop is very good. The aluminum section of the antenna consists of about ¾-inch aluminum tubing which is very strong and durable. The motor section of the antenna is encased in a plastic shield that gives great protection from the rain.

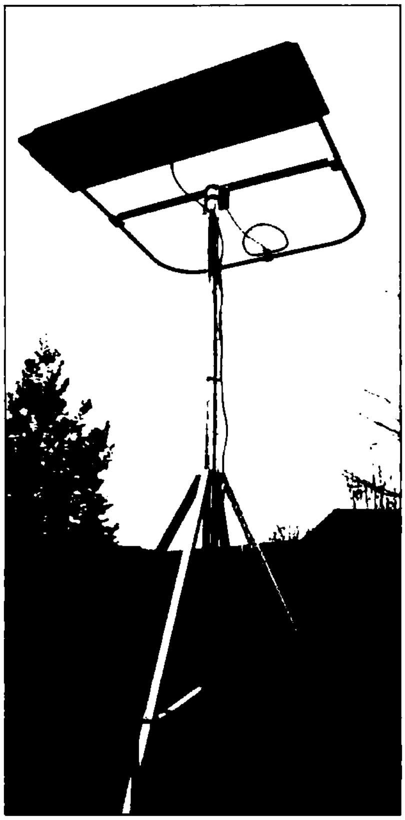


Photo A. The IsoLoop.

The two sides of the rain shield are attached with 14 snap rivets. The snap rivets can be removed very easily in case you need to take the rain shield off to examine the motor mechanism. Also, the rain shield has a couple of small holes in the bottom to drain out any accumulated moisture.

The two separate sections of the antenna are held in place by two couplers which tighten down on the aluminum tubing. In between the couplers, a bar is placed for mounting the antenna on a tripod. The bar is made of wood encased by Fiberglas™.

The Fiberglas seems to be the weakest part of the construction of the antenna. We noticed some minor cracking near the couplers after we tightened them to the bar, even though we were relatively careful to follow the instructions against over-tightening. Because the Fiberglas covers a wood core, the structural integrity of the antenna is not affected.

Theory of Operation

A very popular myth of amateur radio antenna theory states that "bigger is better," and that small antennas cannot ever hope to approach the performance of a full-sized antenna. Proponents of this myth sometimes cite reasoning such as "the capture area is smaller," and therefore a smaller antenna "captures" less signal. The flaws in this reasoning are not particularly obvious and are well beyond the scope of this review. For now, let it suffice to say that the efficiency of an antenna is not dependent upon its size, but upon its losses.

A full-sized resonant antenna (dipole or vertical) has a "radiation resistance" of about 50-75 ohms. Any power dissipated by this resistance is radiated as a signal. Because the resistance of the antenna conductors (loss resistance) is usually very low, often below 1 ohm, a full-sized antenna is very efficient. Most of the power is dissipated by the radiation resistance (as signal) and very little is lost to the resistance in the antenna conductors.

When an antenna is considerably shortened, the radiation resistance drops dramatically and the feed impedance becomes capacitive. To match such an antenna to a 50 ohm transmitter, a series inductor (commonly known as a "loading coil") is required to tune out the capacitance of the shortened antenna. Because a significantly shortened antenna has a much lower radiation resistance, the losses of the loading coil become very significant and the antenna's efficiency is reduced dramatically.

The IsoLoop takes a very different approach to solving this problem. A shortened loop also has a very low radiation resistance, but its feed impedance is inductive. By forming a parallel resonant circuit with a tunable low-loss capacitor, and minimizing any and all resistive losses, it is possible to

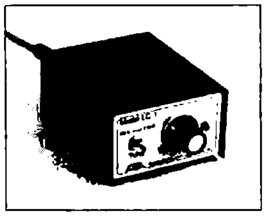


Photo B. The LC-1 control box.

get very high efficiencies. Small transmitting loops have been around for quite a while, having been used by the army for portable operation in Southeast Asia. Ted Hart W5QJR describes the more recent versions in *The ARRL Antenna Book*.

What is new about the IsoLoop is that AEA has used patented techniques to reduce loss without resorting to expensive techniques such as vacuum variable capacitors. This has made the IsoLoop remarkably cost effective.

Mounting

The IsoLoop is primarily designed to be mounted in a horizontal configuration. This provides an omnidirectional radiation pattern with maximum radiation aimed at relatively low angles for good DX performance.

When mounted horizontally, the vertical radiation pattern of the IsoLoop is affected by its height above ground. When it is very close to the ground, maximum radiation is concentrated around 30 degrees. As the antenna is raised, the lobe becomes lower, down to 20 degrees at a quarter-wavelength above ground, and around 13 degrees at a half-wavelength. Like a dipole, the higher the antenna is mounted, the lower the angle of radiation and the better the DX performance. Radiation from the horizontally mounted IsoLoop is horizontally polarized.

The IsoLoop can also be mounted vertically. This provides a completely different characteristic, easily visualized as a vertical doughnut oriented in the plane of the loop (radiation at all vertical angles in the plane of the loop). Nulls in the pattern exist at low radiation angles perpendicular to the plane of the loop, corresponding to the "hole" in the doughnut.

Vertical orientation can be useful for two reasons. First, the "holes" in the pattern can be used to null-out interfering stations. Second, at low heights above ground, better performance at low radiation angles may be obtained. The radiation is vertically polarized in this position.

In either configuration, special attention must be paid to the "dressing" of the feedline and control cable. These must be routed as directly as possible toward the center of the loop, where they are fed through the mast. If this is not done, antenna performance will be affected, and large amounts of RF can be induced onto the cabling, causing feed-line radiation and a "hot" radio chassis.

When the IsoLoop is correctly assembled and installed, closely following the directions and cautions in the manual, feedline radiation is basically nonexistent.

Usage

The tuning of the IsoLoop is remotely controlled by the LC-1 Loop Controller. (See Photo B.) The LC-1 controls a stepper motor which is coupled to the large air-dielectric tuning capacitor mounted in the antenna, allowing the loop to be tuned for any frequency in the 14–30 MHz range.

AEA supplies a 50 foot shielded control cable which connects between the remote tuning box and the IsoLoop (a 100′ control cable is available as an option). A small AC adapter (included, domestic only) powers the LC-1.

The LC-1 has two controls: a dual-position momentary contact toggle switch, which selects either forward or backward tuning, and a dial which sets the tuning speed. To tune to a particular portion of the band, turn the speed control to full speed, and push the tuning switch in either direction, then wait for a noise peak in the receiver. After hearing the noise peak (up to about 15 seconds, depending on where you were previously tuned), slow the tuning speed down, and use the forward/reverse switch to manipulate the noise peak until it is the loudest. After maximizing the noise peak, you sometimes need to retune the antenna slightly in order to get SWR down to 1.5:1 or less while transmitting.

Once tuned, the loop is usable over a fairly small bandwidth (from about 15 to 75 kHz, depending on the band) before the SWR gets high enough (2:1) that retuning is necessary. At this point, retuning is easier. Simply click the tuning switch in the appropriate direction to move the stepper motor one or two steps while watching the SWR. Generally, it takes 20 to 30 seconds to tune the IsoLoop to be usable on a different band, and 5 to 10 seconds to tune it to a different portion of the same band.

Tuning the LC-1 Loop Controller can be tricky if you don't read the documentation. The documentation gives good instructions on how to control the speed of the controller and how to get your SWR as low as possible.

Performance Test Set-Up

We compared the performance of the AEA IsoLoop against a Cushcraft R5 half-wave vertical (all bands) and a full-sized attic dipole on 10 and 20 meters. The R5 was chosen as it covers the same set of bands as the IsoLoop, is in (roughly) the same price range, and has a similar radiation pattern. AEA's literature makes comparisons with a dipole, and suggests the attic as a possible mounting place for their antenna, making an attic dipole a natural comparison antenna as well.

Most of the tests against the R5 were done using tripods and temporary masts on the flat roof of an industrial building on a hill. We performed tests against the attic dipole in an attic relatively free of metal structures—wood framed with cedar shingles—and on dry days to minimize the effects of a damp roof. The R5 was present at these tests as well, being ground-mounted outside the house.

We also tested the IsoLoop in various other locations, including a sun deck about 10 feet off of the ground, on a mast on the ground, and on the roof of a house. The loop was also tested in both the vertical and horizontal configurations in many of these locations.

The transceivers used for testing included a Yaesu FT-767GX, an ICOM IC-741, and a Ten-Tec Omni-V. Cabling for most tests was through Belden RG-213/U or Belden 9913.

Initial Results

We worked a number of stations on 10, 15 and 20 meters on a variety of days, both DX and stateside. On 20 and 10 meters the IsoLoop was consistently 3–4 S-units below the R5, and 2–3 S-units below the attic dipole, both on receive and transmit. Fifteen meter comparisons showed slightly better performance, narrowing the gap between the antennas one S-unit or so.

This didn't seem right so we contacted Mike Lamb of AEA. He told us that we likely had a problem with the connection of the two halves of the antenna. Following his instructions, we used emery cloth to clean the ends of the aluminum tubing, then firmly tightened the couplers which connect them.

The difference was dramatic. The antenna was now generally on a par with our reference antennas. As it turned out, the poor connection between the two antenna halves had introduced enough resistance to cause a lot of power loss in the connection. AEA has updated the manual to include instructions on how to circumvent this problem.

More Test Results

Once we had the IsoLoop working correctly we again performed a series of tests. With the IsoLoop mounted horizontally, 34 feet above ground, the signal strengths (both received and reported) on average were approximately equal to the attic dipole on 10 and 20 meters, with both antennas at similar heights. In some cases one antenna or the other would have an edge, likely depending on the angle of radiation required to make the contact.

Comparing the antenna with the R5 gave similar results. In general, the ground-mounted R5 had a very slight edge in signal strength, but it was more susceptible to noise pickup. Signals from low angles were generally within 1 S-unit on the meter when comparing the two.

Under ideal conditions, with both antennas a half-wavelength above ground and no surrounding structures, the antenna appears to average within one sixth of an S-unit (1 dB) of a dipole on 10 meters, and within half an S-unit (3 dB) or so on 20 meters. Neither of these differences are easily readable on an S-meter, and the IsoLoop has less noise pickup.

When mounted vertically, the IsoLoop seemed much less dependent upon mounting height, and performed rather well even when mounted only several feet above the ground.

Table 1. Specifications

Frequency coverage	14 to 30 MHz
Nominal impedance	50 ohms
Power rating	150 watts
VSWR	< 1.4:1 (no nearby objects)
Temperature range	0 to 50 degrees Celsius operating -50 to 60 degrees Celsius storage
Dimensions	32 inches square
Max. mast diameter	1¼ inches
Shipping weight	12 pounds
Coax connector	UHF (SO-239)
Gain	Approximately that of a dipole
LC-1 power	12 VDC (adapter included, North America only)
Ant. tuner required?	No
Warranty	90 days, requires receipt

When mounted at a half-wavelength above ground, however, the DX performance was noticeably better in the horizontal orientation.

Noise Rejection

One interesting characteristic of the IsoLoop is that for signals received equally on the reference antennas and the IsoLoop, the background noise was generally lower on the IsoLoop.

On the roof of the industrial building, a number of signals that were hard to copy on the R5 vertical because of industrial RFI were very easily copied on the IsoLoop. This was likely due to the horizontal polarization of the IsoLoop's radiation pattern, combined with the tight bandpass which helps prevent receiver front-end overload by out of band QRM.

Even when compared to a horizontal antenna, the geometry of the loop seems less likely to be susceptible to atmospheric noise pickup than a dipole. Although this results in a signal-to-noise improvement in receiving, it of course has no effect on the transmitted signal.

Things We Liked

SIZE: The IsoLoop is only about 32 inches on a side, and square. This is the smallest HF antenna we've ever used, and it fits easily in most attics, although one must be careful to keep it in the clear and out of the range of (two to three feet away from) nearby conductive objects which will detune it.

PORTABILITY: The antenna is very easy to set up and take down. It only took us 10 minutes or so to install the antenna on a temporary mast and tripod on a flat rooftop.

NOISE REJECTION: The tight bandpass of the IsoLoop effectively improves the front-end selectivity of the receiver. The loop design and horizontal polarization seem to help filter out local QRM under many conditions.

Things We Didn't Like

RETUNING: No matter how you cut it, having to retune the antenna frequently as you tune across a band is tedious. If you tune while transmitting to get a good SWR reading, you are wasting spectrum space and possibly causing QRM.

POWER HANDLING: This antenna only handles 150 watts. Don't expect to use it with a linear—you would fry the air-dielectric variable capacitor.

We believe you will be pleasantly surprised, as we were, with the operating characteristics of the IsoLoop. Overall, we found that the IsoLoop performs quite comparably to a dipole or vertical. We definitely recommend it to any amateur who needs a small or portable antenna. ■

Joe Holman KA7LDN and Garth Hitchens KG7GA can be contacted at P.O. Box 37, Redmond WA 98073-0037.

HAM PROFILES

There are no "average" hams!

1990 Scholarship Winners

Five young amateurs are heading off to college this fall with assistance from The Dayton Amateur Radio Association. The five are winners of the association's 1990 scholarships.

Each student received $1,500 toward their tuition at the school of their choice. This program is open nationwide to any FCC licensed amateur radio operator graduating from high school in the year the award is given. There are no restrictions on class of license or course of study planned.

Mary K. Beardslee N8HEY of Kingwood, West Virginia, received the Robert F. Zimmerman Memorial Scholarship. She holds a General Class license and attends Potomac State College.

The Charles G. Frye Memorial Scholarship was awarded to Mark Hendrixson N6WRL of Orange Cove, California. Mark holds a Technician Class license and attends Brigham Young University.

The third scholarship went to Martin Gruen KA2VLP of Barrington, New Jersey. He holds an Advanced Class license and will attend Stetson University.

Jennifer Doerrie KA5WMJ of Booker, Texas, was awarded the fourth scholarship. She holds a General Class license and attends Odessa College.

Michael Adams N8GEV of Chula Vista, California, received the fifth scholarship. He holds an Extra Class license and attends Southwestern College.

Applications for the 1991 program will be available after January 1, 1991. Write *DARA Scholarship, 317 Ernst Avenue, Dayton OH 45405.*

MARY N8HEY

MICHAEL N8GEV

JENNIFER KA5WMJ

MARK N6WRL

MARTIN KA2VLP

DAYTON AMATEUR RADIO ASSOCIATION 1990 SCHOLARSHIP WINNERS

Winners of the 1990 Dayton Amateur Radio Association scholarship awards.

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

Feedback#	Title
1	Letters
2	Never Say Die
3	ORX
4	Quick and Easy Field-Strength Meter
5	Review: AEA IsoLoop
6	Ham Profiles
7	75 Meter 1/4-Wave Sloper Array
8	Alinco Service Survey
9	Dummies for 13.8 Volt DC Supplies
10	Mobile Power Source Organizer
11	End-Fed Copper Dipole
12	More BTUs for the Buck
13	10 Meter Base Station Antenna
14	Solution: AGC
15	Make Your Own Circuit Boards
16	Ham Help
17	Hams with Class
18	Review: Fluke Model 87
19	Build a Portable Mast Mount
20	The Coil Tester

Feedback#	Title
21	Review: Ameritron AL-82
22	Review: Weller Cordless Pyropen
23	Ask Kaboom
24	DX
25	Special Events
26	Updates
27	New Products
28	Hamsats
29	Homing In
30	Above & Beyond
31	Ad Index 9/90
32	Keyword Index 9/90
33	Dealer Directory
34	73 International
35	ATV
36	RTTY Loop
37	DXDA '90
38	Barter 'n' Buy
39	ORP
40	Random Output
41	Propagation

75 Meter 1/4-Wave Sloper Array

Confessions of a contester.

by Alan Hoffmaster WA3EKL

There comes a time in every ham's life when he's got to own up, and I guess it's my turn to let the cat out of the bag.

A 75 meter quarterwave sloper falls into one of two categories. It either works great or it doesn't work at all. A number of hams I have talked to over the air have fallen into the second category, but with a simple modification, they're now enjoying first-category status. OK, get the net ready, because here comes the cat!

Sloper Secrets

The one factor with the greatest effect on a quarterwave sloper's performance is how physically close the top end of the sloper is to the tower leg. If the top of the sloper is more than 1½ inches from the tower leg, it doesn't work at all. It took me a year and a half to discover this. I went from 20th place in a DX pileup to 2nd or 1st place.

There is another trick that helps in working DX. Some antenna sources say to make the angle between the tower and the sloper 45 degrees. This works very well for East Coast-West Coast communication, but it's a very poor angle for DX contacts. The optimum angle for DX contacts appears to be 30 degrees between the sloper and the tower, or 60 degrees between the sloper and the ground. This means you need a tower about 65 feet high for a ¼-wavelength 75 meter sloper.

However, if you have a 50-foot tower you still can achieve good performance from a modified sloper. Attach the sloper to the top of your tower and pull it out so that it makes a 30 degree angle with the tower. About 10 feet up the tower, attach a rope and pull it out parallel with the ground until it contacts the sloper wire. Tie the rope to the sloper at this point. Now pull the remaining sloper wire out parallel with the ground and tie it off to some other 10-foot support point. (See Figure 1.)

Sloper Array for DX

I will now explain my system in detail. First there are three ¼λ-slopers hanging down from the top of a 65-foot tower, one off of each leg, spaced 120 degrees apart. Each sloper makes a 30-degree angle with the tower. Each sloper is fed from a remotely controlled coaxial relay box, thus requiring only one coax feed from the shack. A 24-inch length of 50-ohm coax extends from the box to a homemade bracket on each leg of the tower, very close to the top of each sloper. The bracket consists of a 3-inch length of ¾-inch diameter soft copper tubing, which I mashed flat with a hammer.

One end was rolled around a ⅜-inch bolt in order to create a cylinder about the size of the outer braid of a piece of RG-213 coax. About half an inch from the other end, I drilled two holes for mounting the bracket to the tower leg with a U-bolt. Next, I cut back about one inch of the outer jacket off the 24-inch length of coax. I removed ⅜-inch of the braid to expose the insulation. I then tinned the braid, which I inserted into the cylinder end of the bracket and soldered in place.

I removed about a quarter-inch of the insulation sticking out of the bracket, exposing the center conductor. After mounting the bracket/coax assembly to the tower, I soldered a short piece of #12 wire between the center conductor of the coax and the top of the sloper. The bracket assembly was then waterproofed with coax seal.

One final note. The coax box shorts all unused ports to ground. Therefore, two of the slopers are grounded at all times. The system was tuned by shortening or lengthening each sloper until the SWR was lowest at the frequency I wanted.

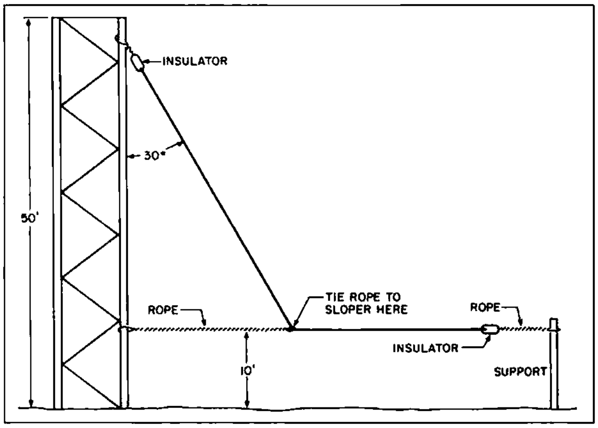


Figure 1. Thirty degrees between the sloper and the tower seems to be the optimum angle for DX contacts.

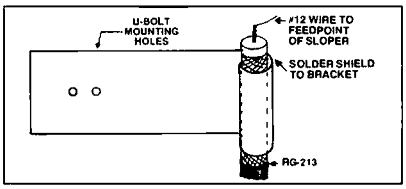


Figure 2. Bracket and feedline mounting details.

Results

The response I have received from DX stations has been overwhelming. During a DX pileup the south sloper usually requires from one to three calls to get the station. The northeastern sloper requires six calls at the most, and the western sloper nine at most. Considering the competition during a major DX contest, that's fairly good.

I seem to be able to hear and work DX stations on the slopers that I can't even hear on the inverted-V at 65 feet. There also appears to be about a 5 dB difference between the V and the slopers. Between the slopers themselves there is about a 6 dB difference on the sloper in the preferred direction.

I know the system is working because we've been averaging between 55 and 65 countries per DX contest in the past few years. Good luck with your system, and good DX.

Contact Alan Hoffmaster WA3EKL at 929 Andrews Road, Glen Burnie MD 21060.

Alinco Service Survey

Alinco may be the best show in town.

by Gordon West WB6NOA

Our service survey takes a close look at Alinco, an energetic and enthusiastic provider of amateur radio VHF and UHF equipment. Alinco is fourth place in distribution volume, with Heathkit close, the latter importing Standard Radio equipment for U.S. distribution. Alinco handheld and mobile sets are produced in Japan, but they're marketed abroad under the Cirfolk label.

This September, Alinco Electronics, Inc., is moving to a new location. See the table for details.

The Alinco Family

Alinco Electronics, Inc., is a member of "The Alinco Group," the parent company which produces all Alinco equipment in Osaka, Japan.

"All of our equipment is made in Japan," says Mark Morisato JN3HSG, vice-president of the Alinco U.S.A. facility. All Alinco equipment is of Japanese origin, a point underscored to eliminate any confusion with equipment possibly manufactured in Korea or China. Nor is any Alinco equipment connected to any equipment produced by Azden, Santec, or N.D.I. Alinco equipment is unique.

Greg Pearson KC6LSY, a newly licensed Technician Class operator, was recently appointed Alinco's sales manager. He says, "We have been around here five years, and we plan to stay. You can see that by our aggressive double-page advertising programs—we want everyone to know about Alinco equipment, and we especially want *73* readers to know about the unique Alinco repair program."

Photo A. The Alinco crew, left to right: Vice-President Mark Morisato, Service Engineer Ahmed Awad, and Sales Manager Greg Pearson KC6LSY.

The Service Facility

The Alinco service facility has just one full-time service engineer. In fact, they have never had more than one—Mr. Ahmed Awad, a good-looking man with a wall full of technical certificates, including a BSEE.

Smiling, Awad says, "I helped design the products for the Japanese; I Quality Control every single transceiver coming in and going out, and I am the only one who will ever lay a hand on a unit to get it fixed."

And he does his job quickly. An inspection of his service log reveals one-day turnaround on all repairs. Ahmed: "And if they come in here Blue Label, we send them out that way, too, recognizing that the amateur radio operator wants his equipment fixed quickly and professionally, and returned immediately."

Automatic Coverage

Alinco equipment is serviced free of charge for the first six months after the dated sales receipt. For a flat rate of $38, the equipment is covered for an additional 1½ years. This rate covers any and all parts, plus any amount of labor to get it fixed. However, you don't have to pay the $38 coverage charge in advance.

Mr. Shunsaku Inoue, President of Alinco in Japan, happened to be visiting Alinco U.S.A. on the same day as our service survey. He commented: "The amateur radio operator doesn't need to spend a nickel to obtain this extra 1½-year flat-rate program—it's fully automatic. All they need to do is to send in their equipment with a copy of their original sales slip, or have a warranty card on file, and this automatically qualifies them for our $38 fix for any type of problem."

After two years, out-of-warranty equipment is repaired at $40 per hour. Most out-of-warranty repairs are under $100. Most of that cost may be for a 45-watt preamplifier brick which runs about $70, or a handheld preamplifier brick for $30. "Our PA amplifiers are extremely strong—they are usually the last thing to ever go wrong."

Common Repairs and Prevention

What are the most common repair problems with Alinco sets? Cracked boards from

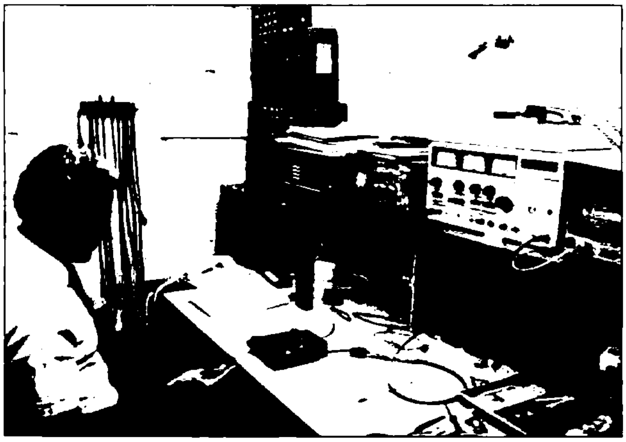


Photo B. The service department at Alinco is furnished with the latest in test equipment.

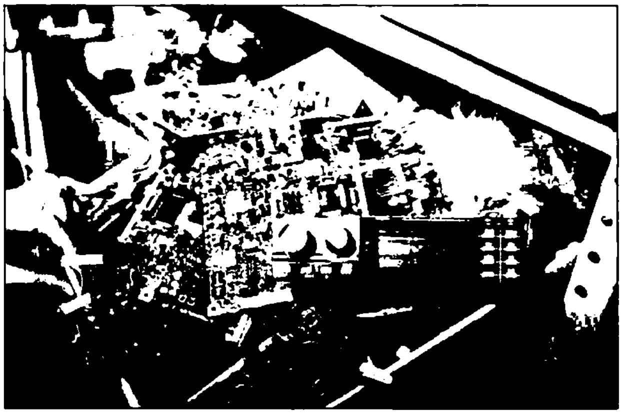


Photo C. Alinco has plenty of spare boards for parts, and boards for swap-out in the event of a tough intermittent.

dropped units and blown caps on reverse polarity hook-ups without a fuse. Every once in a long while, the service engineer says, they find a fractured chip resistor that may not have seated properly during robotic assembly in Japan.

Out-of-band modifications are overlooked for the repair problem. This means that if the out-of-band mod did not wreck the unit, it won't be replaced with normal circuitry. However, Alinco candidly admits that out-of-band modifications are sometimes botched by a ham untrained to work on surface-mount technology.

Every piece of new equipment coming in from Japan is opened up and tested at the Alinco Southern California facility. And that means *every* piece is tested, not just one or two samples out of each shipment. The larger companies don't have time, but at Alinco, it doesn't go to the dealer for distribution until it has been tested.

Come On, Guys! How About It?

Alinco echoed the sentiments of Kenwood, Yaesu, and ICOM about sending in your equipment for repair service: PACK IT BETTER AND GIVE US A BETTER DESCRIPTION OF WHAT CAUSED THE UNIT TO FAIL OR WHAT THE PROBLEM IS.

In other words, if you accidentally ran your alternator with no battery load into the 12-volt DC input to a handheld, causing it to smoke, tell them. Maybe your unit fell into the water, but you completely cleaned it out with an air hose. Let them know any steps you took to correct the problem. Describe *exactly* what happened, or the circumstances under which your unit stopped working! The more information you give, preferrably in writing, the easier it will be for the engineer to track the problem down and the faster he will be able to repair your equipment.

The Alinco service department has plenty of parts on hand for any fix. They even have replacement boards on hard-to-trace intermittent problems. "If it's an intermittent we just can't seem to find, we'll swap out the board."

Looking over their parts bins, they could easily rebuild any one of their seven different mobile VHF and UHF units, and any one of their six different VHF and/or UHF handheld sets.

On average, Alinco receives seven units each day in for repair. These units usually go out the next day, but it may take a few extra days to locate the source of intermittent problems. If there is any delay, Alinco calls the customer. This is why it's important to put your daytime and evening phone numbers on the suggested *73 Magazine* repair form (see the March 1990 issue of *73*) or the letter you send with your equipment. The engineer may need to call you directly.

Units out of warranty are shipped back C.O.D.

Customer Response

Alinco was quick to pull out their correspondence file and show us several letters with favorable comments from Alinco users whose equipment required factory service. All the letters illustrated how surprised they were to find the equipment back within a week of being shipped out.

Because the Alinco service department revolves solely around one service engineer, "the buck stops here" could very well be their motto. The same could be said for the one-day service, with only one person responsible for sending the unit back to the customer.

Alinco recommends that all units be shipped directly to them for repair, bypassing the dealers. "Our valuable dealer network is in place for selling the fabulous Alinco line of single-band and dual-band equipment. We will take care of all necessary repairs." Taking a close look at the surface mount technology inside Alinco sets, I can see why it's best to let the engineering professional work on it. And, of course, Alinco has a plethora of the latest test equipment at their disposal.

Ready to Grow

While you may call Alinco service a one-man show, it could very well be the best act in town. Currently the #4 player of U.S. amateur radio VHF and UHF equipment distribution, their volume is growing through their aggressive advertising program and popular acceptance by the hams owning Alinco equipment. Chances are, more technicians will join the service crew. But for now, Alinco's service engineer stands alone and ready for any incoming repair—a repair that will receive his prompt and personal attention.

Next month we'll cover the service departments of two companies—Land Air Communications, an independent service agency in New York, and General Electric—who may be able to fix ANY brand of amateur radio equipment, old or new. 73

You may contact Gordon West WB6NOA at 2414 College Dr., Costa Mesa CA 92626. FAX (714) 434-0666. Tel. (714) 549-5000.

Alinco Electronics, Inc.

- President: Shunsaku Inoue
- Vice-President: Mark Morisato
- Service Engineer: Ahmed Awad
- Sales Manager: Greg Pearson KC6LSY

Until September 10, Alinco's address is 20705 S. Western Avenue, #104, Torrance CA 90501.

On or around September 10, 1990, Alinco will move to a spacious new office and service facility at: **438 Amapola Ave., #130, Torrance CA 90501.**

The phone and FAX numbers will remain the same: **Tel. (213) 618-8616; FAX (213) 618-8758.**

If you've sent any equipment to Alinco's old address, don't panic. All incoming gear to the old address will be automatically forwarded down the street to their new facilities.

Dummy Loads for DC Supplies

Don't risk your rig!

by David Vail VE1GM

Anyone who builds regulated power supplies for today's low voltage, high-current equipment should consider having a suitable dummy load for thoroughly testing the power supply *before* connecting it to an expensive piece of equipment. If the voltage regulation should fail during development and testing, overvoltage could damage your new super-duper transceiver or amplifier.

When you're looking for a suitable transformer for your supply, you can also use a dummy load to check the voltage sag on a secondary winding at various currents.

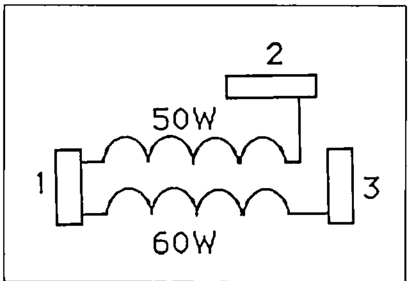


Figure 1. Connections for one headlamp (see table).

Single Headlamp Connections

Terminals 2 & 3	3 amps
Terminals 1 & 2	4 amps
Terminals 1 & 3	5 amps
Terminals 1 & 2+3	9 amps

Simple Dummy Load

My junk box contained an unused sealed beam automotive headlamp marked "60/50W 12 volts." At 13.8 volts, the 50 watt filament draws 4 amps, and the 60 watt filament draws 5 amps. Both filaments in series draw 3 amps, and both filaments in parallel draw 9 amps. Used as a dummy load, this simple device makes a dummy load capable of drawing four different values of current. Since these lamps are designed for continuous operation, they may be safely used for long periods of testing.

More Versatile Dummy Load

Two of these sealed beam headlamps make a dummy load capable of drawing 11 different values of current, namely: 1.5, 2, 2.5, 3, 4, 5, 6, 8, 9, 10 and 18 amps. You can test just about any 13.8 volt power supply that you'd use in a ham shack, at a price that's hard to beat.

With this dummy load, you can experiment with power supply design, construction, and adjustment. You can check such things as the adequacy of pass transistor heat sinks, stability and reliability of voltage regulators at various output currents, and the trip points of overvoltage protection circuits. You can do all this without putting your valuable radio equipment at risk.

Checking Power Transformers

Automotive headlamps should safely withstand 16 volts. For brief periods, you can use them at 18 volts to check the voltage sag across low voltage secondary windings. At 15 volts, the load's current drawn will be about 8% higher than at 13.8 volts; at 18 volts, it will be about 30% higher.

Connections

To minimize voltage drop across the leads, make connections to and between the lamps with fairly heavy wire. Number 12 wire would be suitable for the maximum load of 18 amps. Headlamps have provision for using push-on connectors, which makes it convenient to interconnect the two lamps for different load values. The illustration shows how to interconnect the lamp filaments for the various load values. 73

David Vail VE1GM, 50 Porter Street, Yarmouth, N.S. B5A 2Y9.

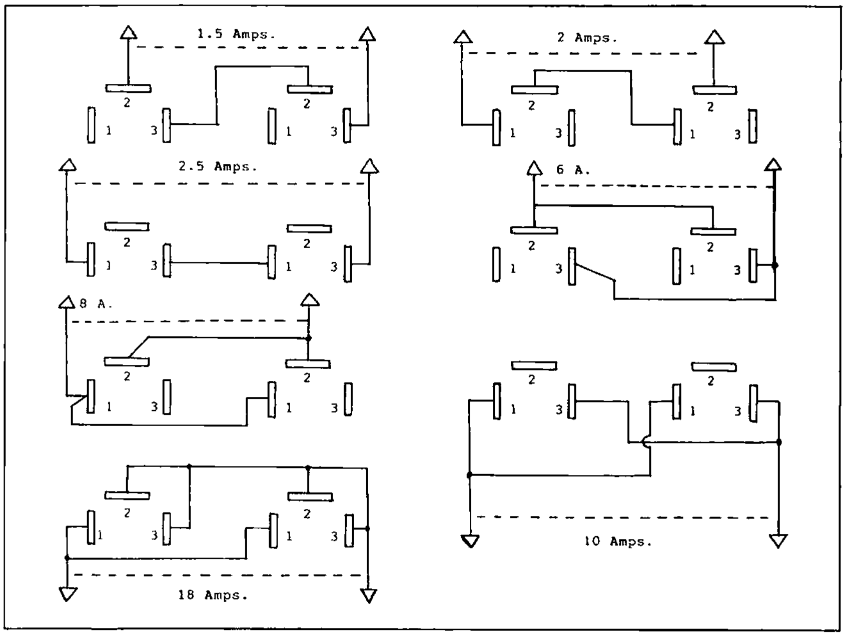


Figure 2. Connections for two headlamps.

Mobile Power Source Organizer

Easy 12 volt hookups for your mobile gear.

by David K. Pelaez AH2AR/8

When operating a mobile or portable station from my car I always wind up asking myself the same question; "Where am I going to get additional 12 volt lines for the transceiver and the amplifier?" Aside from the obvious safety considerations, this is one of the universal problems with running an amateur TV transceiver as a temporary portable mobile station. You may also need to run other ham radio gear in your vehicle on a temporary basis. For example, the addition of a provisional packet station may need different power connection schemes than what is already available. Using various patch cords to connect up through a cigarette lighter jack or to the fuse block under the dash can be adequate, but the final outcome in interfacing more than one "temporary" 12 volt connection to several pieces of gear starts to take on the appearance of an artfully-prepared multicolored bowl of spaghetti.

To help tame the tangled disorder of a temporary transceiver and amplifier setup within the family wagon, look no further than the junk box or the local Radio Shack store. It is possible to run a 12 volt lead directly from the automobile battery and terminate this run to an enclosure that organizes the various 12 volt connection schemes. This will give you a means to readily obtain power to supply 12 volt DC to different types of ham gear.

The Saving Circuit

You can custom design the features in this mobile power source organizer to suit your own needs. In the design described in this article I used features that I found indispensable for my particular applications, including:

1. Capability to run up to 20 amps.
2. A means of filtering the DC prior to the power entering the equipment.
3. A main power switch and a power indicator light.
4. Several connection schemes that include terminal posts and an RCA type chassis-mounted phono jack to supply power to the temporary gear.

Any type of metal chassis will make a suitable enclosure. I used an aluminum box that I picked up at a hamfest. Be sure to use heavy gauge insulated wire (I used 12 gauge multi-strand) in all of the point-to-point connections. This insures that your organizer can handle the designed 20 amp load. The run of cabling from the 12 volt battery to the enclosure should also be 12 gauge. I opted to run this line directly to the battery so the additional load would not overload the automobile circuits.

Several types of noise filters are suitable for this project. I used a Radio Shack design. The heavy-duty noise filter from Radio Shack helps lessen the chance of ignition noise getting into the ham gear hooked up to the organizer. This filter will also alleviate alternator whine while transmitting. It has two mounting lugs to attach it to the bottom of the chassis, making it easy to place inside the enclosure. The filter is embedded in epoxy and uses some heavy-duty chokes and a capacitor. It becomes a "passive" part of the circuit, placed in series with the +12 volt line after the line passes through the fuse and the switch on the organizer. The black wire coming out of the filter is then connected to one of the mounting lugs attached to the enclosure chassis ground.

Depending on the type of terminal posts that you use, make certain that the +12 volt post doesn't come in contact with the automobile chassis as you move the organizer inside of the automobile. Most of the terminal posts that are currently available are properly insulated (the ones from Radio Shack are) so this situation may not be a problem for you.

Parts List	RS #	$ Cost
SPST switch (25 amp)	275-708	1.99
Fuse holder	270-739	.99
Fuse (25 amp)	Bus type	.99
Terminal posts	274-662	1.59
Heavy-duty noise filter	270-055	17.95
LED 12 volt chassis mount	276-011	1.99
Chassis	—	—
12 gauge insulated wire	—	—
Phono jack (RCA type)	274-346	4 for $ 1.99

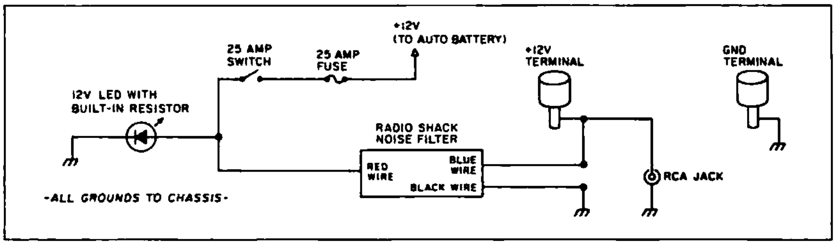


Figure 1. Circuit layout.

The World War II era posts that came out of my junk box were not designed this way so I have resorted to putting a plastic cap on the positive terminal when my organizer is not being used. I don't recommend putting more than a 5 amp load on the phono type jack, but I have found that these jacks make very convenient low-current power supply jacks.

The Results

It took about two hours to build the organizer. The hardest part of the project was determining where to pass the 12 volt cable through the fire wall of the automobile.

After feeding the cabling through and placing the organizer in the auto, it was time to give the organizer the acid test. The following day I took the car up to Bellefontaine, Ohio, (highest elevation in Ohio) and worked ATV DX from the parking area at High Point. As a side note, when not hooked up and in use, the mysterious-looking box in the auto can be used to dissuade back seat drivers from attempting to verbally take over the steering wheel. Right below the power-on toggle switch and the indicator light you could place red DATAK lettering stating: "EJECTION SEAT ARMED." ■

End-Fed Copper Dipole

Why buy when you can build?

by Mike Gray N8KDD

I needed a good 2 meter antenna which would be suitable for both stationary mounting and remote-site use. I could have purchased an antenna which would meet the requirements, but that wouldn't satisfy the burning desire to build something, and I can build eight antennas for the price of one commercial vertical.

This project is easily constructed from parts found in any plumbing supply store. It can be tuned to any frequency, but the overall distance from the lower coupler to the top of the upper element should be less than 40 inches. Wind may cause problems with a longer antenna.

See the "Components List" for this project. Most of us have some scrap plumbing in the garage. The pieces are too short to use but too good to throw away. Drag it out—you saved it for a project just like this! You will also need a propane torch, a tube cutter, and a bottle of PVC pipe cement.

Tubes

Start by cutting two copper tubes to the proper length for the frequency at which you intend to operate. Make them a little longer if you like, and shorten them during the tuning phase.

¼-wave element (inches) = 2808/frequency(MHz)

File the inevitable burrs from both ends of each tube and polish them bright with sandpaper. While you have the sandpaper in hand, polish the inside of one end of each tube to prepare it for solder.

Heating the outside of the copper tube with a torch, tin the inside of one end of each copper tube with rosin-core solder. Cut the PVC pipe to length. Make it a minimum 12 inches, but not longer than 30 inches. If the PVC pipe is much longer the force imparted to the lower coupler during a wind storm may be more than the coupler can take.

Cement a coupler to one end of the PVC tube, and slide one of the copper tubes into the coupler. Don't cement the copper tube to the coupler yet.

Cable

Feed the coaxial cable through the PVC pipe, and through the copper pipe. The cable should come through the tinned end of the copper pipe.

Strip ¼-inch of jacket from the cable. Separate the braid from the center dielectric, then twist it together to form a conductor equal in length to the center conductor. Tin the center conductor and the twisted braid no more than ¼-inch from the end. (The braid needs to remain flexible for this to work).

Bend the braid into a "J" shape and solder it to the inside of the tinned end of the copper tube. Heat the outside of the tube—don't burn the cable.

Once the braid is soldered to the lower tube, pull the coax through the tube as far as the braid will allow it to go. Slide a coupler over the coax and onto the copper tube. Solder the center conductor to the inside of the upper tube in the same way that you soldered the braid to the lower tube.

Slide the upper element into the coupler and seat it gently. If it won't slide all the way in, polish the copper tube with sandpaper.

Measure the resistance between the upper and lower elements. If the meter indicates that the elements are connected electrically, pull the assembly apart and track down the short. Do not attempt to tune the antenna unless the meter indicates infinite resistance between the copper elements.

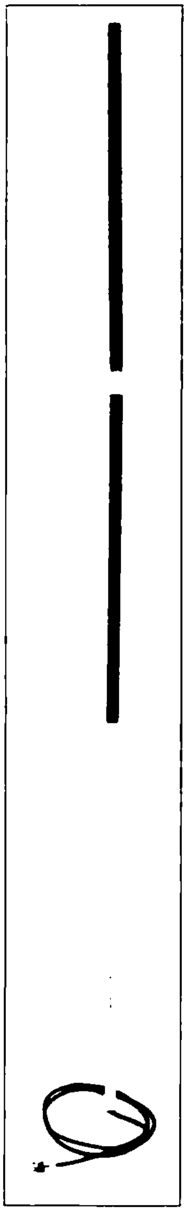


Photo A. The completed antenna.

Tuning

You originally cut the copper to approximate lengths. Now you need to cut them to resonate at the frequency you intend to use most often.

Clamp the PVC tube to a suitable support, keeping the copper as far as possible from any objects which might reflect. Measure the SWR above and below the target frequency.

Using a tube cutter, remove about ¼-inch from the top element, then check the SWR. More copper will probably have to be removed. If so, it should be removed from the lower element this time.

Gently pull the lower tube from the coupler and cut the same amount from the lower tube that you removed from the upper tube. If there is a connector on the feedline, the waste copper ring will not slide off, so cut the ring of copper with a pair of diagonal cutters. Reassemble the antenna and check the SWR.

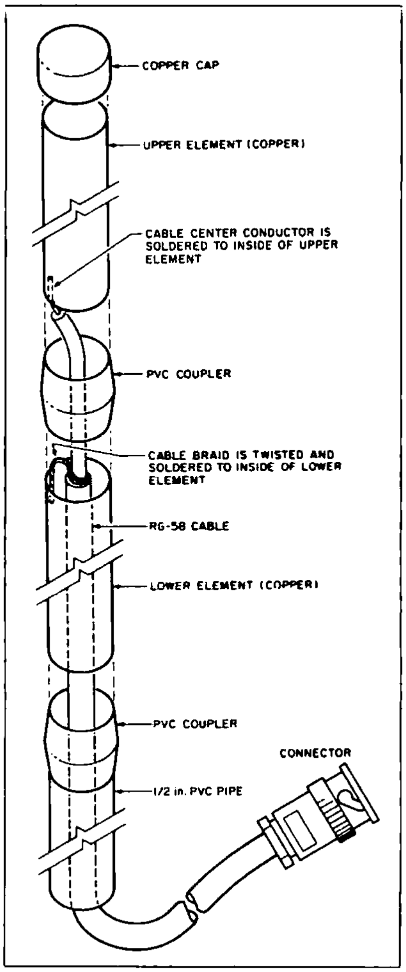


Figure 1. The end-fed dipole.

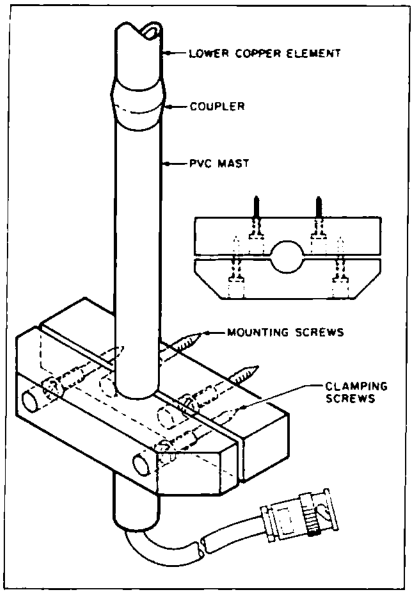


Figure 2. Detail of the clamp

Repeat this process as many times as necessary to obtain the lowest SWR. If you are working inside a building you may not get lower than 1.5:1 until the antenna is mounted outside.

If you cut too much copper from the antenna (this almost always happens) install the copper pipe cap on the upper element. The cap will fit tightly, and can be adjusted vertically for the lowest SWR.

Pretty Work

Once the antenna is working properly, solder the copper cap to the upper element. Pull the copper tubes apart and apply a liberal amount of cement to the couplers. Reassemble the components, making sure the tubes are seated just as they were during tuning.

Place the assembly on a flat surface and roll it to reveal any misalignment. If it isn't straight, bend it gently until it rolls smoothly, then allow the cement to dry for at least four hours. Fill the bottom tube with caulk or similar material to relieve strain on the coax and keep the spiders out of your new project. When the cement has dried, install a BNC or PL259 connector on the coax (if it has not already been done). Sand the antenna lightly and paint it with enamel. Paint is necessary because the copper will corrode in time without protection.

Mounting

You probably won't be able to convince the spouse to hold your new antenna at arms length while you engage in a long conversation, so you will need to mount it somehow. The PVC pipe can be clamped to an upright member of nearly any material without affecting the performance, but keep metal objects at least eight inches from the elements.

I built a clamp for my antenna from a piece of scrap two-by-four. The clamp is screwed to a fascia board on the backside of the house. To make this clamp, cut a piece of two-by-four about five inches long (length isn't critical). Bore a ⅝-inch diameter hole through the middle with a paddle bit. Cut the board through the center line of the ⅝-inch hole. Drill and countersink two screw holes in each piece of wood to fit your installation. Make sure that the holes are offset because two of them hold the fixture and two hold the clamp. (See Figure 2.)

Holy Toledo! It Works!

You will notice an improvement in performance over a quarter-wave ground plane antenna while transmitting, and a huge improvement in reception. The reason for better reception may be due to the greater "capture area" afforded by the tubing.

Build a few more of these. The second one takes much less time than the first. ■

Components List

2 Quarter-wavelengths of ½-inch hard-copper pipe
 146 MHz: 19.23 inches
 222 MHz: 12.65 inches
 440 MHz: 6.38 inches
2 PVC couplers (the type used to join pipe end-to-end)
1 ½-inch PVC pipe, at least 12 inches long
1 ½-inch copper pipe cap
1 length of RG/58 coax

More BTUs for the Buck

Inexpensive alternative to industrial heat guns.

by David McLanahan WA1FHB

A heat gun is a valuable addition to any electronikker's tool box. Its primary use is to form heat-shrink tubing over wire connections to today's miniature sockets and plugs, and for in-line wire connections. A closely related use involves the melting of solder "preforms" for coaxial connector terminations and similar connections. Carefully used and properly baffled, a heat gun can even be used to remove soldered-in components. This is one of the recommended ways of dealing with the new "flat pack" integrated circuits raging through electronic products these days.

The problem for amateurs is that we really need a product that is available only through industrial channels and at industrial prices—in the neighborhood of $100. The more frugal of us have played with electric hair dryers, only to find that their temperatures are too low, and that they are composed of materials and safety features (per the Underwriters Laboratory specifications) that make higher temperatures difficult to attain.

Hot Enough For You

Enter the consumer-oriented "paint stripping gun," a cheap ($20-30) discount store device capable of generating the temperatures we need. For example, the Black & Decker 9751 paint stripping gun is said (by the manufacturer) to give temperatures of 730-830 degrees Fahrenheit. It is available for as little as $19 at your local discount store. This price, however, does NOT include the necessary heat-guidance accessories that are sold separately. I've been trying to buy these guides for several months without success. A number of discount stores in my area sell the guns almost by the cord (a measure usually applied to firewood), but the friendly neighborhood discounters gave me blank looks when I asked about the little formed sheet metal heat guides that the box represents as "optional accessories."

Finally, I journeyed over to one of the primary heat gun sources—a Black & Decker Company store in Maine. Amazingly, they not only didn't carry the recommended accessories, but they weren't even able to furnish prices and ordering information! They did give me, however, a list of "Company-Owned Service Centers" and told me to write (or call) one of them to find out how to get the little stamped metal parts we needed.

Get 'em Locally Made

These heat guides can be locally fabricated, but there are two caveats. First, common (unprotected) rolled steel may rust after the protective oil coating is burned away; second, galvanized sheet metal may be hazardous, since it liberates zinc vapor at high temperatures. Even if I do manage to get the B&D shield kit, I'm sure they will have to be bent a bit for electronic use, but that is probably easier than starting from scratch. Going to the local metal works shop, however, can be an inexpensive route, and allows you to get heat guides custom-made.

In Closing

Just remember, please, that heat gun temperatures are capable of causing serious (and painful) burns as well as starting fires. Do *not* confuse a heat gun with the normal hair dryer it closely resembles. It MUST be used with great care!

No matter how you solve the heat-guidance problem, the paint stripper gun is a good, inexpensive alternative to a costly but useful electronic tool.

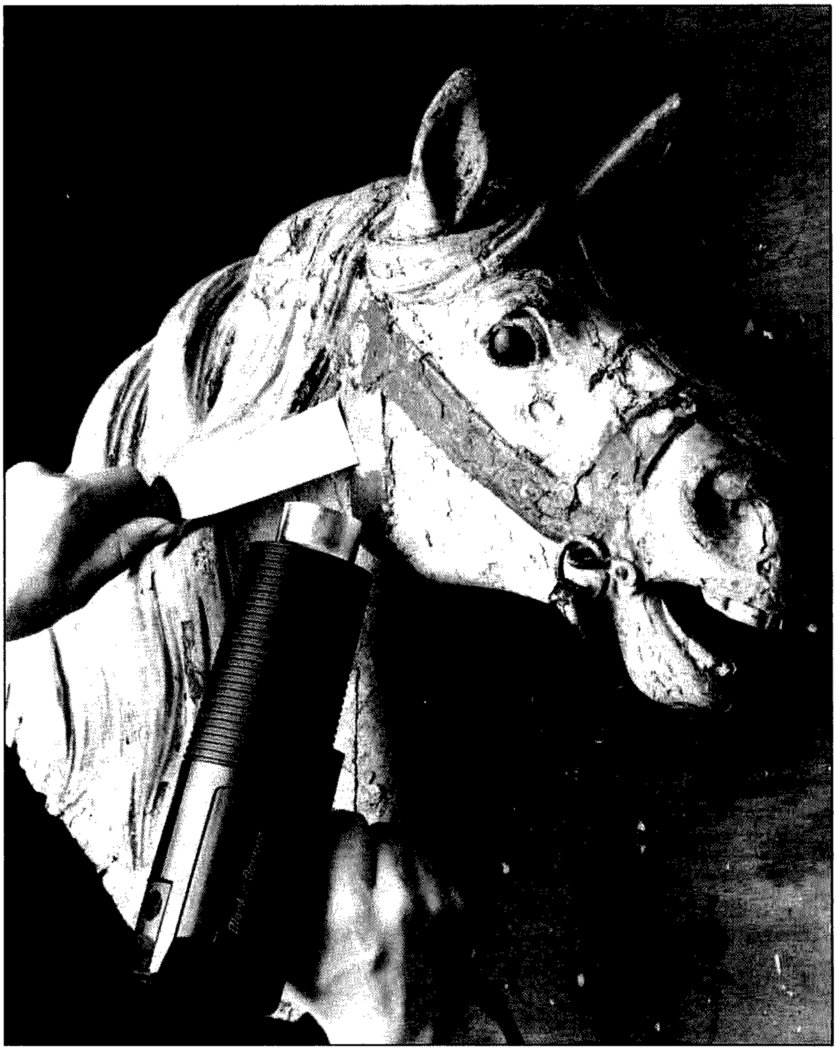


Photo A. The B&W paint stripper gun. Have your own heat guide made at a local metal shop and voila!—a cheap alternative to the industrial heat gun.

10 Meter Base Station Antenna

Ready in two hours!

by Russ Stein WA6ZOS

Recently I converted a Hy-Gain CB board to 10 meters FM. I had heard about the growing activity on 10 meters, and I wanted to investigate it for myself. After the low-cost conversion, I needed an antenna to give my new 10 meter FM equipment a fair chance. I was interested not only in working distant stations on skip, but also in local ground-wave communications. A vertical antenna with a low radiation angle would be ideal.

Antenna Design

I had read that antennas manufactured for the CB market could easily be tuned for 10 meters. Unfortunately, I found no local source for new or used CB antennas. I knew I had to build one, but I needed to come up with a mechanically simple design. My first ideas revolved around the regular ground-plane antenna, with radials at the base. This proved to be too mechanically involved, so I examined a coaxial dipole, which promised to be more mechanically convenient.

The feedpoint impedance of this type of antenna is closer to 75 than 50 ohms, but on 10 meters the losses due to this mismatch would be negligible.

Photo A. Wrap the wire around the pipe, extending upward about an inch from the hole where the center conductor exits. Note the position of the 47pF disc capacitor. The PVC pipe fits snugly inside the TV mast.

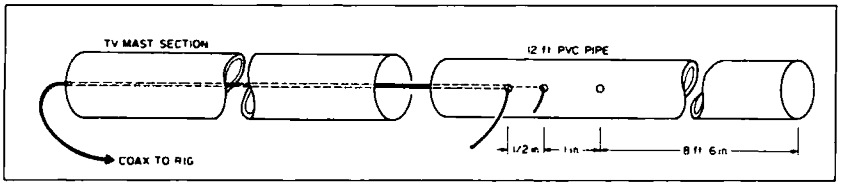


Figure 1. Snake the prepared end of the cable up through the TV mast section. Pull the braid through the first hole and the center conductor through the second.

The coaxial dipole seemed the best choice, so I set out to build one. I calculated the dipole, at 29 MHz, to be about 17 feet long. I found enough materials on hand to construct the antenna. For the coaxial part of the dipole, I used an old 10-foot TV mast section. Leftover Sch. 40 PVC sprinkler pipe provided support for the antenna's vertical radiator. For the latter, I used #14 solid insulated wire. To keep water out, I used a PVC end cap.

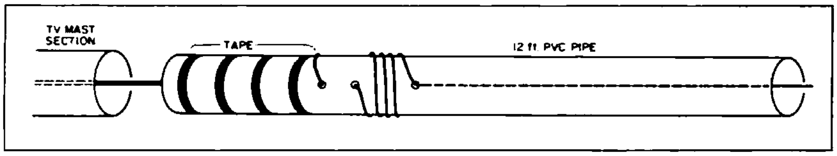


Figure 2. Connecting the TV mast to the PVC pipe.

Ready for Testing in Two Hours

The antenna was very easy to build, and in about two hours I had it mounted on the roof of my single-story house. The SWR was about 2:1 at 29.6 MHz and increased to over 2.5:1 at 29.0 MHz. At 29 MHz, the feedline losses would not make a sizable difference in system performance, but would my solid state transmitter be able to handle the mismatch?

The transmitter tolerated the high SWR, but it put less power into the feedline than into a 50 ohm load. I decided to use the antenna to sec how it would perform. The band was open and active, so I began calling CQ with my 3 watt "peanut whistle," on the chance I might make a contact.

The results were amazing. In a few hours I had worked stations in Texas, Mississippi, Illinois, Minnesota, New York, Florida, and Wisconsin, as well as a couple of local California stations, one 30 miles distant. Signal reports were very good, and I was pleased with how well the antenna worked.

Ten meter FM was so much fun, I left the antenna as it was for several weeks and just enjoyed myself. It was clear that this antenna design worked well, but I wanted to correct the impedance mismatch so I could run more power. This proved to be relatively easy to do by adding a simple LC matching network. After the change, the antenna had an SWR of 1.2:1 at 29.6 MHz, where I tuned it for lowest SWR, and it increased to only 1.5:1 at 29.0 MHz.

Construction Details

First, obtain a 10-foot metal mast. Using a hacksaw, cut it to 8′ 6″ in length. Use sandpaper to roughen and clean the inside, where you made the cut. Starting at the bottom, snake your feedline, RG-58/U or RG-8X, through the mast section. Cut six inches of insulation off of the coax and separate the braid from the center conductor. Cut the center conductor 1-½″ long, and remove ¼″ of insulation.

Next, obtain a 10-foot section of PVC pipe. Measure 8′6″ from one end of the PVC pipe, and drill three holes with a ¼″ drill. (See Figure 1.) Snake the prepared end of the cable up from the end of the PVC pipe closest to the holes, with the braid coming out the first hole, and the center conductor coming out the second hole. I found it helpful to insert a piece of small-gauge solid hook-up wire through each of the two lower holes and out of the mast end, then solder one to the braid and one to the center conductor. This allows you to pull the cable up inside the mast with the two parts of the cable coming out the correct holes. Use the same method to pull the #14 solid wire from the far end of the pipe and out through the last hole.

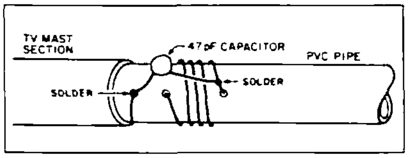


Figure 3. Position of the capacitor.

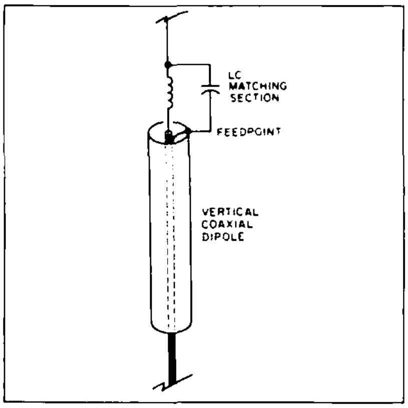


Figure 4. The vertical, coaxial dipole.

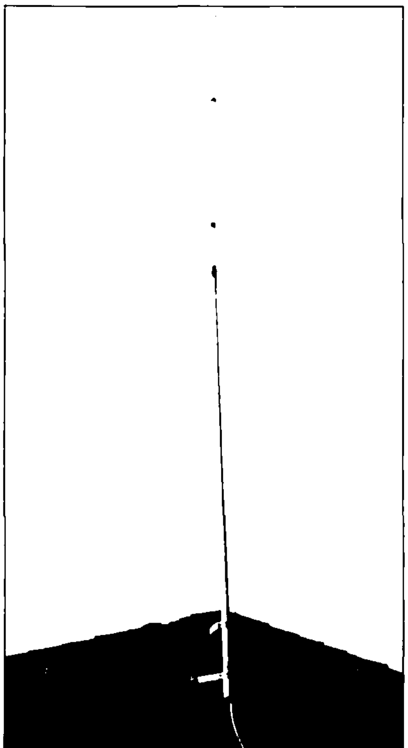


Photo B. A trim, inconspicuous, but hot performer. Notice the connectors between the pieces of PVC pipe.

Leave about six inches of extra wire at the end of the pipe, where the #14 wire exits the hole. Remove a section of insulation about ¼" long, and tin the bare section. Then wrap the wire around the pipe for four turns, evenly spacing it over the 1" of pipe to the middle hole, where the coax center conductor exits the pipe. (See Photo A.)

Remove the insulation from the end of the #14 wire, solder the wire to the coax center conductor, and tape the connection. Wind tape over the four coil turns to hold them in place, but don't cover the exposed bare wire section near the hole. Prepare the end of the PVC pipe nearest to the holes by wrapping it with four or five thicknesses of electrical tape one tape-width. Use just enough to fit it snugly inside the metal mast section.

Next, wrap one tape-width every six inches or so, up to six inches below where the coax braid comes out. Just below this, wrap three turns of electrical tape, one tape-width.

Insert the end of the PVC pipe into the metal mast section until you get to the last wrap of tape near the braid. Now, wrap the braid around the pipe and sandwich it in between the tape and the inside of the mast. Make sure the braid is in tight contact with the mast, then securely tape the junction of mast and PVC pipe. Drill a hole in the center of the PVC end cap just large enough for the #14 wire radiator.

At the end of the PVC pipe where the #14 wire comes out, push it through the hole in the cap, then seat the cap on the end of the pipe. Pull on the #14 wire to be sure it is straight inside the pipe, and bend it back down over the cap. Cut the wire so only about an inch extends down the side of the end cap. Tape the entire end cap to secure the wire and to seal against moisture.

The antenna is now complete, except for the addition of the 47 pF disc capacitor. (You could also use a 100 pF mica trimmer instead, to tune precisely for lowest SWR.) You will need to solder the capacitor from the bare section of wire radiator where it comes out of the pipe to the braid of the coax (see Figure 3). Wrap the PVC pipe with tape from where it joins the mast section to an inch or so to the other side of the last hole. You may want to use a weather sealer, such as Scotchkote® over the tape for better weather protection. You can mount the antenna with regular TV mast hardware. Since the mast is part of the dipole, mounting should be on non-metal surfaces, or you can use insulators, if needed. The antenna performs best with the feedpoint 16 feet or more above ground.

I've been using this antenna at 100 watts with absolutely no problems. Its performance has been impressive. Considering the low-cost and easy construction, this hot performer for 10 meter FM is is hard to beat. Why not put one together and enjoy? See you on 29.6!

Russ Stein WA6ZOS, 7593 Frederiksen Ct., Dublin CA 94568, has been a licensed ham since 1966. He is currently the Communications Technician Supervisor with the City of Berkeley, and is responsible for the design of radio, telephone, alarm, and computer systems, as well as their installation and maintenance.

Solution: AGC

A circuit with wide applications.

by Fred Baumgartner KA9NEH

One of the neatest things to come along in ham gear is hands-free operation. I like to work while I operate, which means I have a nasty tendency to back too far away from the mike. My other operating habit involves 2 meters and a noisy old car. Drives me nuts having to adjust the volume as different stations with different deviations and mike habits check in.

The solution is an automatic gain control (AGC). This generic building block answers a million needs.

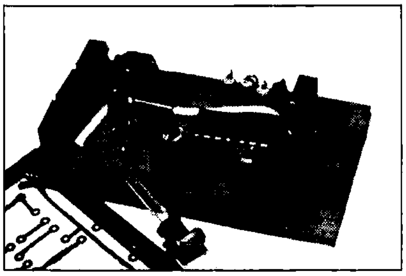


Photo. The AGC circuit is simple and useful.

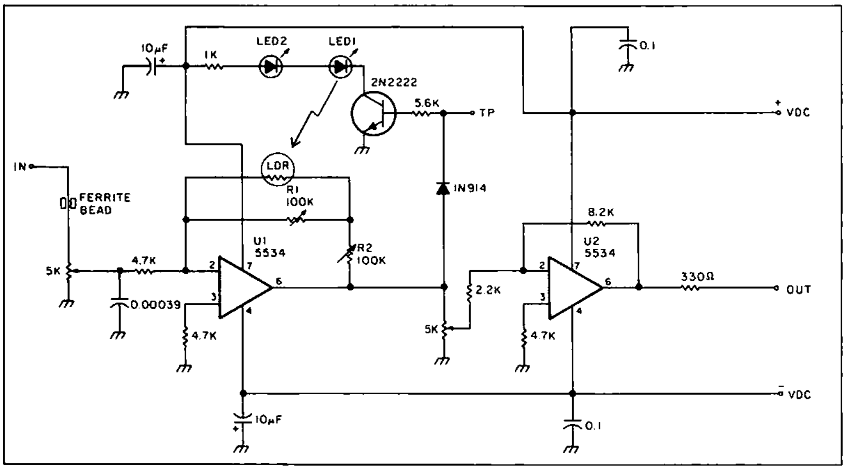


Figure 1. Circuit for the AGC.

What is an AGC?

An AGC is an amplifier with control over its gain. The gain is varied as the input changes. If it is very rapid (fast as a cycle of the input), the device becomes a compressor. Compressors serve useful functions; they control noise and increase modulation density, which allows maximum modulation and lowest noise floor. This is important when communicating in a very noisy channel.

If the input is slower, the AGC only averages out the audio level to make it more or less the same. If an actual compressor is used, an AGC would go before it. The AGC is then used to control the audio level before major "processing " is applied.

Operational Amplifiers

Op amps make it easy to design all sorts of amps and signal processing units without having to worry about the internal dynamics of the amplifier itself. This is why I have chosen to use them. In Figure 1., you can see that I use two amplifiers. The first is the gain control element itself and the second is an output buffer. If you want to take a microphone level input, you need a microphone-to-line level amplifier ahead of the AGC. If a microphone level output is required, you need a dropping pad on the output.

The gain control amplifier is a simple op amp with a variable resistance in the feedback loop. This resistance is keyed to the output of the amplifier. The control element is a CdS cell, available for pennies from your local Radio Shack. This is tied to an LED; as the output from the amplifier rises, the LED lights and reduces the resistance in the feedback loop, which consequently reduces the gain.

Potentiometers

There are four pots on the AGC board. The first controls the input level. It allows you to set the input in the middle of the active AGC range.

Two pots control the characteristics of the AGC. The pot in series with the CdS cell sets the minimum gain of the device. At minimum resistance, it has minimum gain under full input and maximum AGC control. The pot parallel to the CdS cell restricts the maximum gain of the stage. At minimum resistance, the AGC is at minimum gain and there is no AGC action. At maximum resistance, the AGC has the most control.

The three pots can be set to control the characteristics of the AGC amps. With the AGC working hard, any input from +20 dB to −30 dB comes out at about 0 dB. See Figure 4. In most communications circuits, this will also bring noise up to average levels. This ability is a bit much, so the controls

Parts List

Qty	Description
2	100k potentiometer, R1 & R2
2	5k potentiometer
2	red Light Emitting Diode, LED1 & LED 2
1	1N914 diode
1	2N2222 transistor
2	10 µF electrolytic capacitor
2	0.1 µF capacitor
1	0.00039 µF capacitor
1	8.2k ¼W resistor
1	5.6k ¼W resistor
3	4.7k ¼W resistor
1	2.2k ¼W resistor
1	1.0k ¼W resistor
1	330 ohm ¼W resistor
1	Ferrite Bead
2	NE5534 op amp IC, U1 & U2
1	CdS photo resistor, LDR

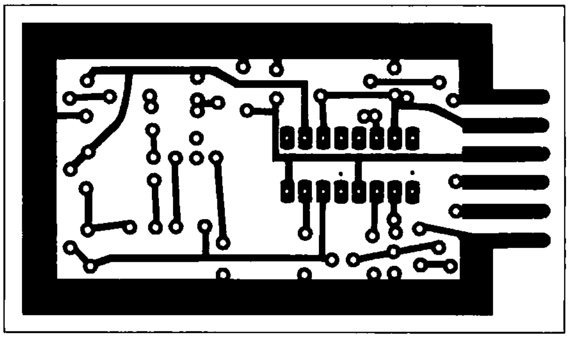


Figure 2. Foil diagram.

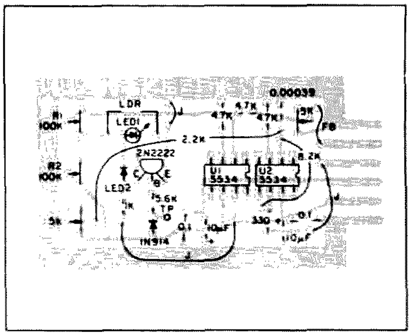


Figure 3. Parts placement diagram.

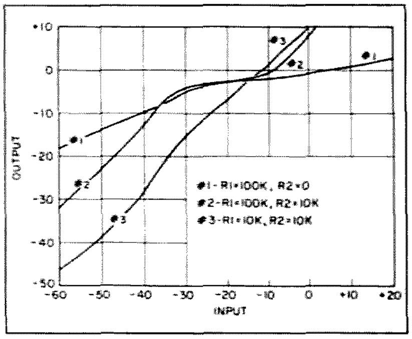


Figure 4. Three pots control the characteristics of the AGC amps.

allow you to reduce the range of the AGC.

The fourth pot controls the output level. This convenience makes matching the next stage easier.

Versatile Applications

The small PC board fits easily in most units. Any sane construction method, however, will work. The two 5534 op amps are put in one 16-pin socket. The CdS cell is superglued to a standard red LED with the top portion filed flat, almost to the LED junction. Optical coupling is pretty tight. The CdS cell/LED needs to be light-tight. I dip it in black paint then wrap it in black electrical tape. If light gets into the CdS cell, it will reduce the amplifier gain the same as if a strong audio signal had been applied.

It's best if the power supply is ±15 volts, but even at ±5 volts, the device performs rather well. When the series LED (identical to the one on the CdS cell) is visible, significant gain reduction is occurring.

A setup using the regular audio is most often ideal.

One of the results of the low parts count and easy to obtain parts is a certain amount of distortion. At about 1% it would just begin to be heard in a good stereo system, but not even close to noticeable in a communications circuit.

The uses for the circuit are endless—phone lines, phone patches, recorders, and so forth. 73

You may reach Frederick M. Baumgartner KA9NEH at 3825 S. Olathe St., Aurora CO 80013.

Make Your Own Circuit Boards

The reliable method.

by Hugh Wells W6WTU

The increasing complexity of electronic circuits requires construction on printed circuit board material. Over the years, many techniques have been developed for making boards quickly and efficiently. Unfortunately, the new ways have left the project-oriented ham way behind because not all of the processes are readily available.

To answer the ham's need to be able to make neat, functional and reliable boards, I present the following process. In some respects, the process is archaic and slow, but it is effective, repeatable and reliable. It supports both single- and double-sided boards. Most of all, the process is easily within the reach of all project builders, and materials are available from local distributors. All of the materials you need are shown in Photo A, except for chemicals and drill bits.

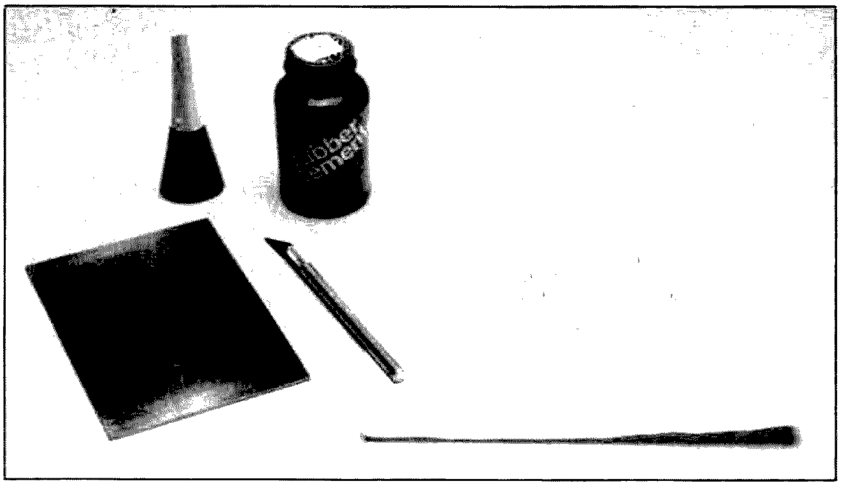


Photo A. Materials used in the board-making process.

Caveat

Speaking of chemicals, copper etchants, new or used, are bad actors! If you have kids, pets, or even just an absent-minded nature, be careful how you store, use, and dispose of etchant or etchant-contaminated materials!

In this process, you simply use white bond paper as a mask while you apply an etch resist. The mask is removed after the etch resist has dried. You complete the board with normal etching and drilling.

Preparing a Mask

Begin by photocopying the circuit pattern onto white paper. The 1:1 size ratio is important, but white-to-black contrast is not. Make two or three copies as a backup for goofs, and in case you want to use one later for another project. The process is also suitable for an original design which has not previously been traced. Make a rough layout of the parts and wiring while working out a suitable parts placements diagram and trace routings.

Remember that during layout, all parts must be viewed from the bottom (trace side). Also, during trace layout, consider leaving as much copper on the board as possible. Wide copper traces exhibit low resistance, are easily inspected, and will save the life of the etchant. One philosophy is that copper, once removed from the board, cannot easily be replaced. Therefore, take off only the amount required to make the circuit functional. The final layout of the trace pattern is made on white bond paper. Preserve the original and make a 1:1 ratio photocopy, since the mask is destroyed during the board-making process.

Following the layout of the trace, you should make a parts placement (or stuffing) diagram. Parts placement is viewed from the top of the board (opposite of the trace side).

Preparing the Board

Select the board material and cut it close to the finished size. The first time you use this process, I advise that you make the board over-large by 1/16 to ⅛ inch. The extra size will accommodate errors in mask alignment.

After cutting the board to size, smooth the edges with a file or stone. Next, polish the copper with fine steel wool to remove dirt and oxides. Rinsing the board with alcohol or lacquer thinner will remove oil and fingerprints. Hold the cleaned board by its edges.

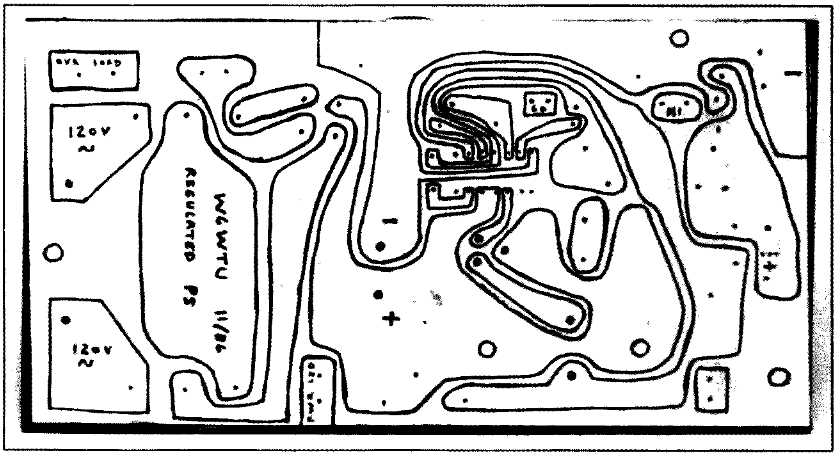


Photo B. Trace pattern rubber-cemented to the board.

Number 16 on your Feedback card

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS /Hamhelp SIG. (2400 baud, 8 data bits, no parity, 1 stop bit. (603) 525-4438). Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters 1 or i, or even the number 7. Thank you for your cooperation.

I am in need of schematics and service info for the Allied A-2516 ham band receiver. Also, schematic for ELCO 715 power/SWR checker. Will pay any copying costs, etc. *Jon Danford KA0SOV, 2115 Joplin Ave., Joplin MO 64804.*

I would like to hear from anyone who has successfully applied amateur radio, cellular telephone or satellite relay equipment for reliable phone patch communications from kayaks or small boats in remote waters, e.g., Baja California or Tierra del Fuego, South America. *Keith R. Higgins WA6IYL, PO Box 306, Lakewood CA 90714.*

Need service manual and schematics diagram for the SWAN/CIR Astro 200A PLL, all solid state transceiver. Will pay copy and postage charge. Call *(606) 573-7844* after 2100Z, *or send QSL with quote to* Patrick Benesch N4MSQ, Gen. Del., Loyall KY 40854.

I need schematics and/or manuals for a Dana Model 4700 digital voltmeter and for a Dana Model 8020B (with option 200) frequency counter. I will purchase or copy. Please send a postcard first. Thanks. Brian Gillam N4KDF, RT 3 Box 607, Appomattox VA 24522.

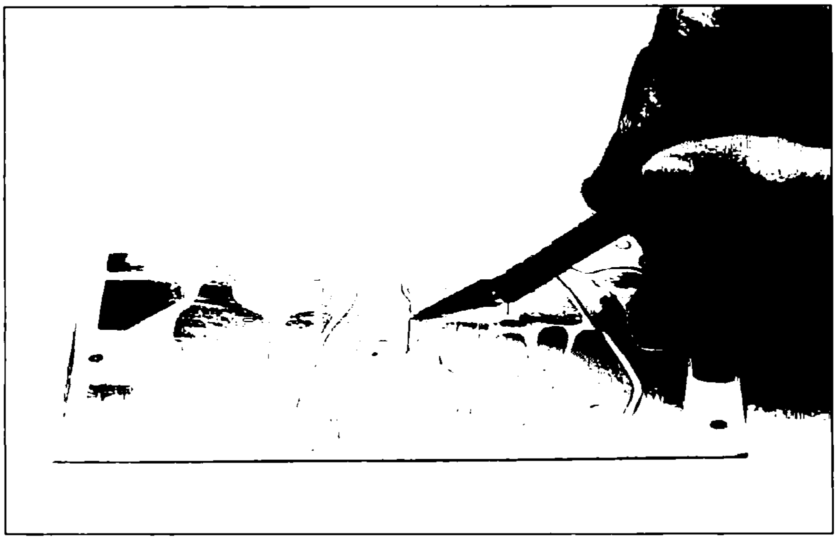


Photo C. Cutting the trace pattern from the mask with the knife held at a low angle.

ment. You may correct errors at this point.

Remove paper burrs with the knife blade. Remove spots of rubber cement by rolling a ball of dried rubber cement over them, or by wiping them with a soft rubber pencil eraser. You can correct cutting errors, such as a torn or lifted mask, during the application of resist material. Paint the adjacent copper trace with resist to hold the mask in place. Repair any resist running under the partially lifted mask after the mask is removed.

Applying Resist

Resist is any material that protects the copper during the etching process. The etch removes all exposed copper not covered by the resist. Any material capable of rejecting water will work as a resist. Fingernail polish and lacquer-based paint have proven to be excellent resist materials. Fingernail polish is applied with the brush from the bottle, and lacquer may be brushed or sprayed on. Spraying, although faster than brushing, tends to cause small voids in the resist, making it less desirable than brushing.

Apply the resist material directly onto the exposed copper where the paper trace was removed (see Photo D). To facilitate paper mask removal, confine the resist to the trace area and keep it off of the paper as much as possible. Allow the resist to dry completely, and then carefully remove all the remaining paper mask. Once all of the paper mask is removed, inspect the bare copper for resist material between traces.

Transferring the Pattern

Apply rubber cement to the copper on the board and to the back side of the paper mask (opposite the trace side). The rubber cement must be spread thin to eliminate lumps, but the whole surface must be covered to prevent voids. While the rubber cement is still slightly tacky, position the paper mask over the copper without touching, and align the paper to the board. Lower the paper and make contact, preferably at the center of the board. Press the paper down against the board, rubbing from the center toward the edges to remove bubbles.

If wrinkles occur in the paper, you will have to decide whether to use the trace as-is or start over from scratch. Sometimes it is possible to lift an edge of the paper to remove a wrinkle. When lifted, you will have to add rubber cement to the exposed copper, then rub the paper down flat. Any paper hanging over the edge of the board should be cut flush using scissors or a sharp knife. Photo B shows the paper trace cemented to the board.

Wait a few minutes for the cement to dry, then transfer the trace to the copper. Mark the spots for drilling holes with a sharply pointed instrument such as a scribe or sharpened nail. Hold the pointed instrument vertical to the board and press hard enough to make a small dimple in the copper. *Copper dimples easily.* The purpose of the dimple is to identify each drilling location after the board is etched. Before you begin marking, practice dimpling on a piece of scrap board so that you can determine the amount of pressure you require.

Using a sharp knife, cut the paper along the edge of a circuit trace, as shown in Photo C. Hold the knife at a very low angle to prevent pulling and tearing of the paper. Bear down lightly—you want to cut only the paper, not the copper. Don't worry about some creasing of the copper. Try to cut along the entire trace line back to the beginning point without lifting the blade. Lifting the blade and starting another cut along the same line may cause a paper burr. After the trace has been cut completely along all edges, lift one end of the paper trace and remove it from the board, exposing the copper. Watch for uncut paper fibers, and cut them off during the paper trace lift-off to prevent lifting of the adjacent mask.

The exposed copper is the circuit trace you want to save. Continue cutting and removing the paper trace pattern until all of the copper trace is exposed. Inspect the copper trace for cutting errors, paper burrs, and rubber cement.

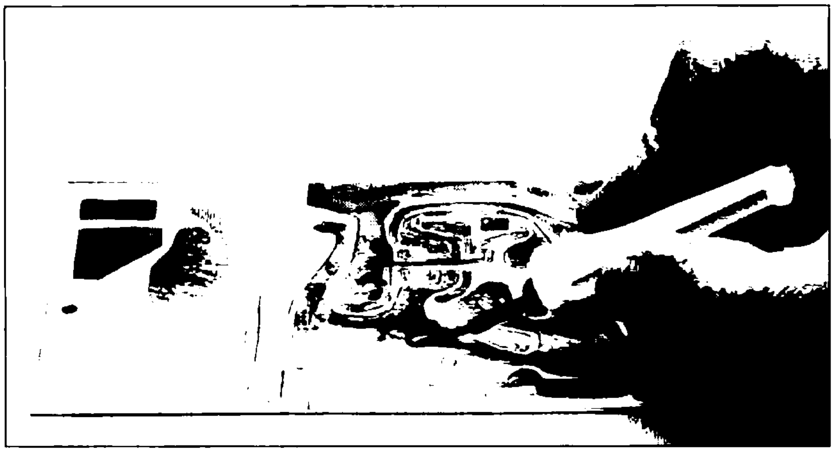


Photo D. Applying the etch resist on the copper with a brush.

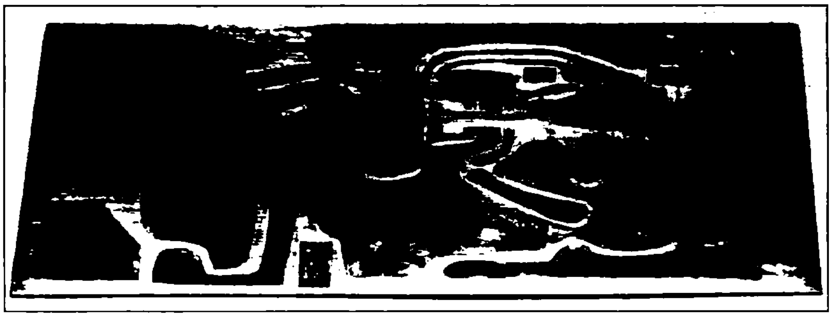


Photo E. Etch resist on the board with the mask removed.

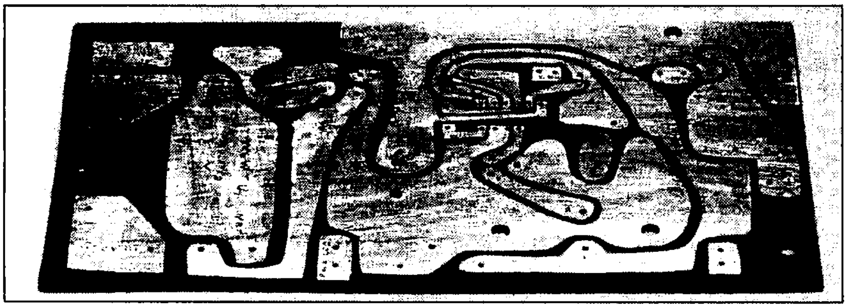


Photo F. The completed board after etching, drilling, and solder coating.

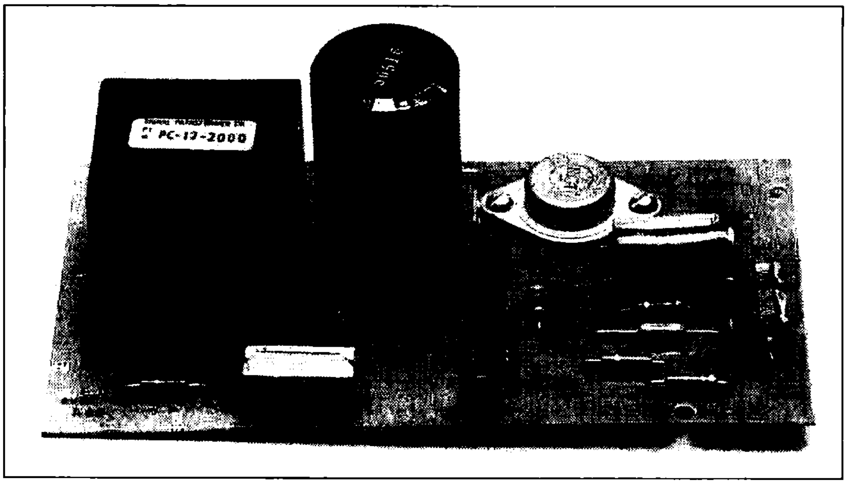


Photo G. The completed project after component stuffing.

The exposed copper will be removed during etching. A bright light and magnifying glass are great aids for inspection. Correct bridging by cutting the resist and scraping it away. Because of the narrow spacing, run the knife blade between IC pads as a precaution against shorts. Make trace opens, add a trace, or correct an error by brushing resist onto the copper as needed. After the resist has hardened, cut and scrape the resist with the knife to obtain the final trace pattern and spacing.

Marking the Board

Many times it is desirable to identify terminals and voltage points on the board. Before etching, the marks may be scratched into the resist with the scribe after the resist has dried. Any scribe marks placed on the bare copper will be lost during etching. Where room is available, a patch of resist may be placed on the copper and the marks scribed into it. The copper must show through the scribe marks in the resist to be etched. Photo E shows the board ready for etching.

You may also use a black marking pen, since the ink contains enough water-resistant material to restrict etching. Take care with this, however, since the ink from many resist pens tends to break down and become porous during exposure to ferric chloride etchant, making the ink unsuitable as a reliable trace resist. Of course, after the board has been etched, you can use the marking pen on the component side of the board to identify part polarity and location.

Finishing the Board

You may etch the board after the resist is dry, about half an hour after it is applied. Trace smearing may occur during handling if you rush too much.

Many techniques have been developed for etching printed circuit boards, any one of which is satisfactory. However, a simple and easy technique is to pour ferric chloride into a plastic or glass tray to a depth of about ¼ inch. Float the board, copper side down, on the surface of the etch. If you use green Fiberglas™ board material, you can observe the etching process through the board. You may have to lift one edge of the board occasionally to purge trapped bubbles.

When the process appears complete, remove the board, wash it with tap water, dry it with a paper towel, and inspect it. If the etching is incomplete, float the board again. When you use a wide trace pattern, you don't have to worry about over-etching. The heat from a small incandescent lamp, close to the etch, will speed up the etching process.

Another suitable technique for etching uses a zipper top clear plastic bag as an etch container. Place the board in the bag and pour about one inch of etch on top of it. After sealing the top, lay the bag flat, with the copper facing down. Gently moving the bag will displace bubbles. You can inspect the board through the plastic any time during the etching process. Take care to prevent leaks in the bag.

Materials Needed for PC Board Etching

Copy of the circuit trace (actual size).
Fingernail polish or lacquer paint (any color other than clear).
X-acto knife or equivalent with a pointed blade.
Rubber cement for paper use only.
Printed circuit board material cut to size (single or double sided, as required).
Sharp scribe or pointed nail.
Fine steel wool (clean and oil free).
Lacquer thinner or acetone.
PC board drills #57 and #62, or as required.
Copper etchant (ferric chloride or equivalent).

Procedure Summary

1. Prepare a 1:1 ratio copy of the circuit trace.
2. Clean the copper on the board.
3. Coat both the paper mask and the copper with rubber cement.
4. Align the paper to the board, press down and rub from the center to the edges.
5. Indent the hole locations with a scribe.
6. Cut along the trace lines with a knife held at a very shallow angle.
7. Remove the paper in the area of the trace. Repeat steps 6 and 7 until all the copper trace is exposed.
8. Inspect the exposed copper.
9. Paint the copper with fingernail polish or lacquer. Attempt to keep the paint inside the trace area.
10. Allow the paint to dry.
11. Remove the remaining paper mask.
12. Inspect and repair the trace pattern.
13. Etch the copper.
14. Remove the resist.
15. Drill and clean the board.
16. Solder coat the trace.
17. Install the components.

After the etching process is complete, remove the resist with a solvent such as lacquer thinner, acetone, or nail polish remover. A small amount of solvent on a paper tissue will clean the board. With the resist removed, the board is ready for drilling. After drilling, clean the board with steel wool and solvent before stuffing and soldering components.

Hole sizes are a matter of personal choice and application. I suggest the following drill sizes as a guide: #57 drill for ½ watt resistor leads and jumper wires; #62 drill for IC pins, transistor leads, and ¼-⅛ watt resistor leads.

Solder Coating

After etching you may wish to add a solder finish to the copper trace. The advantages are better solder-ability, uniform appearance, and reduced copper oxidation. To solder coat the board, you must first clean it with fine steel wool and a solvent.

To solder-coat the board: 1) Coat the copper with rosin flux; 2) Place a small drop of solder on the flat tip of a 25-30 watt soldering iron; 3) Touch the solder to the copper and draw the iron across the copper, leaving a solder trail and adding small amounts of solder from time to time; 4) Continue drawing solder over all of the exposed copper until it is uniformly coated; 5) Clean the coated board with solvent to remove the flux. CAUTION: Move the iron rather rapidly to prevent burning the board or lifting the copper. Practice the coating proccss on a scrap board to work out the technique.

Photo F shows the board after it has been etched, drilled, and solder-coated. Photo G shows the board after it has been stuffed with parts.

Double-Sided Boards

You can make double-sided boards using this same process. However, you must take care to preserve registration of the two sides. The trace patterns for both sides must be registered to each other with keying targets or marks before you start the process. Otherwise, the second side will need trace adjustments.

Prepare the first side of the board as you would for a single-sided board. I suggest that the first side be the more complex trace pattern. You may have to adjust the second side to accommodate the registration.

Rubber-cement the first trace pattern onto the board and allow the cement to dry. Cut the trace pattern as for a single sided board and add the resist material. When you've finished the first trace transfer, turn the board over and cover the second side with resist. Next, etch the first side, then remove the resist from the second side. The resist may remain on the first side if you want, but inspection of the trace must not be inhibited by the presence of resist.

Drill small holes through the registration marks to provide keying for the second side trace registration. Insert wire pins through the registration holes and stabilize them with resist. Prepare the trace pattern for the second side. Prick the registration marks in the mask to provide easy access for the pins. Coat only the back side of the paper mask with rubber cement. Place the mask onto the pins, but do not press it against the board. Hold the board by its edges and inspect the two sides for trace orientation. Lift the paper mask off the board as far as possible and coat the copper with rubber cement. Starting in the middle of the mask, press the mask down against the board and rub outward. Allow the cement to dry completely, and again inspect for orientation.

If in doubt about registration, drill two or three component holes through the board from the first side. If the hole locations have a close match by landing on the desired solder pads, then proceed with the trace transfer on the second side. However, if second-side trace adjustments are required, drill all of the holes through the board from the first side. Using a pencil, mark the trace adjustments corresponding to the hole positions onto the paper mask. Proceed with the trace transfer and resist application. Before you etch the second side, you will have to re-coat the first side of the board with resist to cover scratches and exposed trace edges. Etch the second side, then remove the resist from both sides.

Double-sided boards usually require plated through-holes for making circuit connections from one side of the board to the other. In lieu of plating the holes, when room on the board permits, you can add registered pads to each side of the board to accommodate a jumper wire. If the board was designed for plated through-holes, and plating is not available, you will have to solder every component lead on both the top and bottom side of the board to provide the through connection. ■

HAMS WITH CLASS

Kids are Talking

Carole Perry WB2MGP
P.O. Box 131646
Staten Island NY 10313-0006

Marketing Our Hobby

Amateur radio is a dynamic, multi-faceted hobby and service. As such, it is comprised of many factions and special interest groups. This is as it should be. Any organization that wishes to grow and expand its horizons must always pay attention to its component parts and to move forward in a way that best serves the interests of the whole entity.

The one issue that I feel should be of concern to all special interest groups in amateur radio is that of growth and expansion. "Growth" in the sense of increasing our membership, and "expansion" in the sense of all of us being receptive to new ideas and approaches.

We have so much to offer people if only they knew it! I have often sat in a Burger King or a McDonald's and wondered why local ham clubs weren't advertising (for free in most cases) their willingness to go into a local school for a demo, or the fact that they were conducting license classes.

I have never gone to a ham convention where I didn't make a mental note to myself to scream at someone for not tapping the very obvious segment of the population of attendees called "spouses." There's probably not a male ham radio operator reading this who at one time or another hasn't forced, begged, cajoled or bribed his wife to "just get a license." Wouldn't it be nice if at a convention we could offer a weekend introductory course on "How to Surprise Your Spouse and Get a Ticket"? Perhaps we'd see large numbers of women attending a convenient workshop which could offer practical help on how to get started and what to do next in a non-threatening (translation: no husband being present) environment. How many husbands could really successfully teach their wives how to drive? Let's not leave ham radio motivation and instruction in their otherwise very capable hands, either. Let's send the ladies to workshops conducted by professionals. Let's get well-trained instructors who can best encourage them and show them how much fun it can be—especially when they surprise the "old man." We need some good marketing efforts here. Just think: If it's successful, we'll be doubling the number of hams in the family—not to mention eliminating the need to have "How to Care for Your Petunias" forums at conventions.

Helping People Find Us

I can let my fingers do the walking through the Yellow Pages to find most things I'm looking for. Why can't someone find out where the nearest ham radio club is located by doing the same thing?

I feel that all the dialogue about the no-code license and the license restructuring is addressing the cart first rather than the horse. I'd love to see the '90s be the decade of a huge marketing and enlightenment effort on all our parts. We already know that what we've got here is pretty terrific; now let's tell the rest of the world about it. Good sound marketing techniques are what we need.

My own best efforts and expertise are in the area of education. This is a wide-open, wonderfully fertile area in which to incorporate amateur radio. Having taught "Introduction to Amateur Radio" in a New York City school for nine years, I can tell you that the possibilities are as limitless as your imagination. We hope to use this column as a forum to encourage letters, requests and questions about using amateur radio in the classroom, about how to motivate young people, or perhaps to keep the general ham population aware of how they can all play a vital role in helping youngsters discover all that is so terrific about amateur radio.

All thoughtful questions and ideas are welcomed. Let's use this column as a resource to help each other. 73

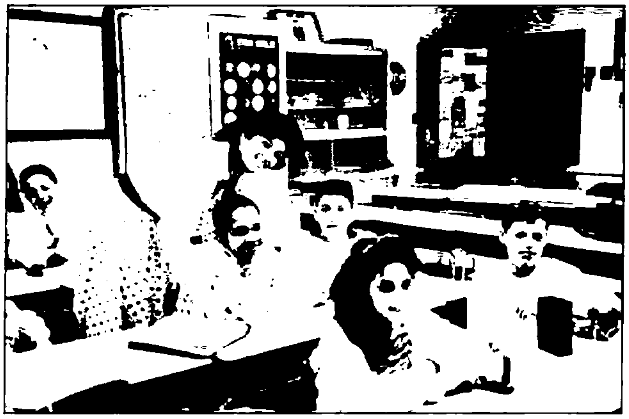


Photo B. Carole WB2MGP having some fun with the students in her ham radio class.

Carole Perry WB2MGP has been teaching "Introduction to Amateur Radio" at Intermediate School 72 in Staten Island, New York, for nine years. She is the creator of the curriculum currently being taught to sixth-, seventh- and eighth-graders. She is the president and founder of Media Mentors, Inc., the company that markets the curriculum package.

Carole received the prestigious 1987 Dayton Ham of the Year Award, the 1987 ARRL Professional Instructor of the Year Award and the 1987 CONEX (QCWA Northeast Chapters) Teacher of the Year Award. NASA Education Department selected her to attend a special Educator's Conference and a VIP viewing of the Space Shuttle Atlantis in April 1989.

Carole is also an ARRL Assistant Director in the Hudson Division and is Chairperson of the Hudson Division Educational Task Force. She is presently serving on the National Education Committee of QCWA. In 1988 she was selected to be an Educational Advisor to the ARRL Education Department.

Photo A. Dawn, Kevin KB2JNP, Carole WB2MGP and Mary KB2IGG.

Build a Portable Mast Mount

A "spare" mount that's always ready.

by John R. Somers KC3YB

If you've ever tried to erect a temporary antenna on a mast under emergency or even Field Day conditions, or on a parking lot at a country fair, or in a roadside picnic area during a UHF opening, you will realize the need for this little mount. It's dirt cheap and small enough to keep in the car for whatever situations may arise, and it makes life so much easier!

The Need Exists

The problem with any antenna mast is that it won't just stand there by itself; it has to have something to hold it up. Normally this is accomplished by guy wires and anchors, but this solution isn't always convenient, or permissible, such as in the aforementioned parking lot. Besides, it seems that one of the main functions of guy wires, in most cases, is to trip people. What we need is something that will support an antenna mast unaided. Something that will always be close at hand.

While rearranging the trunk of my car one day, I realized just how heavy a spare tire and wheel are. The thought occurred to me that some type of mast support connected to the wheel would be easy to erect and more or less self-supporting. As the wheel already had bolt holes, my support could merely bolt in place when needed.

The Two-Minute Support

Using a couple of short lengths of 1¼" angle iron, I welded them together into a "T" shape positioned so that they would cover bolt holes in three places on the wheel. Then I welded an 18" piece of galvanized mast vertically to the tee. After aligning the assembly, I marked the location of the holes I needed, and and drilled three, using a ½" bit.

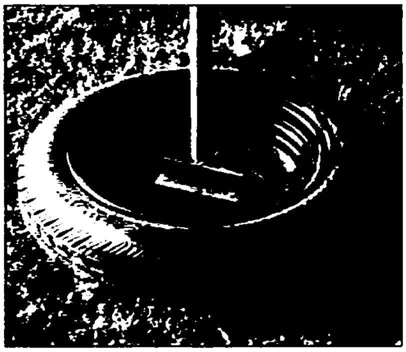


Photo. Once constructed, you can assemble this mobile mount for your antenna in about two minutes! Note that the wheel is positioned brake drum side up.

To hold the assembly together, I use 1½" bolts and wing nuts so I don't have to worry about carrying tools with me. When not in use, I keep the bolts, washers, and nuts attached to the mast support so I don't lose anything. When I need to use the mast, I can assemble it in a couple of minutes. I have found that the unit is more stable if I assemble it with the brake drum side (concave side) of the wheel up, which lowers the center of gravity.

A Starting Point

As I expected, how well the mast stands unguyed depends on which antenna is on top. I can generally attach a 2 meter collinear at the top of 20 feet of mast. Likewise for a small UHF array, while about fifteen feet is tops for a portable 2 meter beam. Obviously, wind has an effect as well. A guy ring attached near the top, with wires or ropes, will increase usable mast height and stability. Wire antennas, particularly inverted-V's, work well for this purpose.

For Field Day, you can interconnect several of these mounts with dipoles in between and slopers or guys on the ends. You can even use a small beam antenna, though it will definitely require guying. The advantage in this case, though, is the ease with which you can raise the mast assembly.

Although the mast support described above can be pressed into service in a number of ways, the important thing is that you can get your antenna up, and get on the air, quickly and without a whole lot of fuss. Sometimes, a few seconds saved can be important. ■

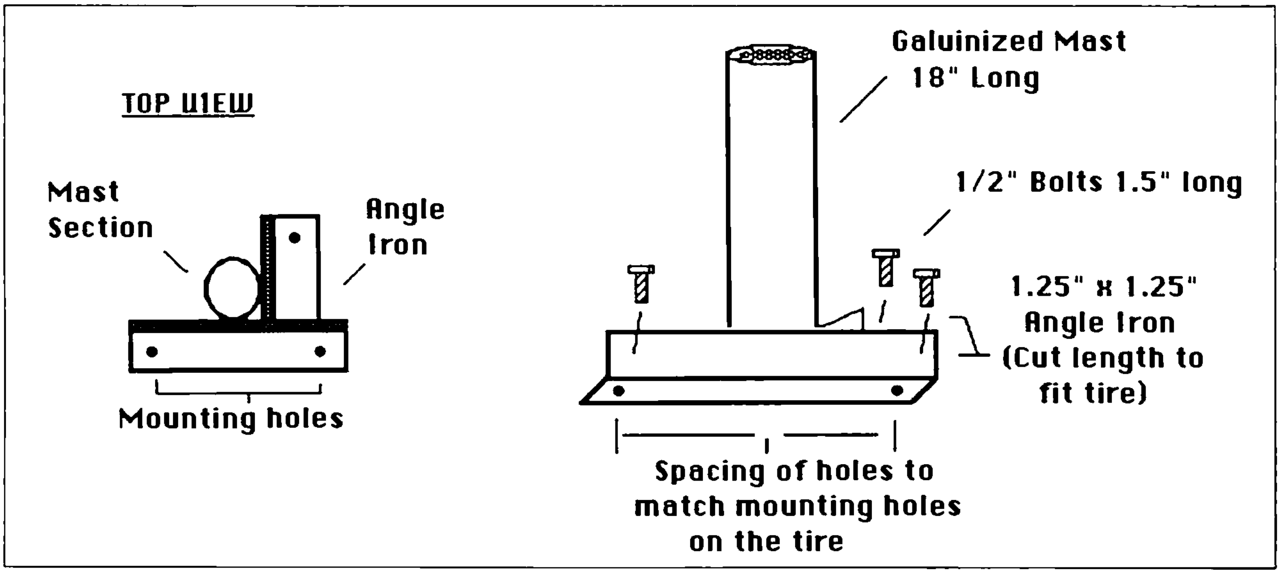


Figure. All you need are: two pieces of 1¼" x 1¼" angle iron (length to fit wheel); 3½" x 1½" hex head bolts; 3 ½" washers and wing nuts; and one piece of galvanized steel antenna mast.

Number 18 on your Feedback card

73 Review

by Larry R. Antonuk WB9RRT

Fluke Model 87

A new digital multimeter from the 80 Series.

John Fluke Mfg. Co., Inc.
P.O. Box C9090
Everett WA 98206
(206) 347-6100
Price Class: $290

In late 1983, the Fluke Manufacturing Company rocked the electronics world with the introduction of the 70 Series of digital multimeters. The top-of-the line, Model 77, was the first handheld to have both digital and analog readouts.

It was tough, easy-to-use, small, and even had a "memory." It would remember the last reading it took–handy if you were using it in a hard-to-reach spot. Pretty neat stuff. It wasn't long before Fluke 77s were as abundant as Simpson 260s.

The New Generation

Not being a company to rest on its laurels, Fluke has recently come out with the next generation of DMMs, the 80 Series. The 80 Series truly represents the next generation of instruments, not just a new color case and a different ad agency. The features that made the Model 77 stand out were enhancements to the basic DMM operation—range hold, bar graph, diode testing. The features that make the Model 87 stand out are the inclusion of completely different test instruments along with the meter—a frequency counter and capacitor checker.

All the basic DMM features of the 77 are included and made easier to use. In addition, the Model 87 provides true RMS voltage readings. And the unit will report minimum, maximum, and average readings, on the various ranges, over a period of up to 36 hours.

It is tempting to place the 80 Series in the Fluke line right between the 70 Series and the 8000 Series of professional handhelds, but this series refuses to be pigeonholed. The Model 87 has a built-in frequency counter and it's not a second-thought feature. The counter has 200 Hz to 200 kHz ranges, with excellent accuracy and resolution. (While the accuracy over 200 kHz isn't specified, my test unit measured a 455 kHz local oscillator with no problem.)

We can't group the Model 87 with other audio frequency counters, though. It's also a capacitor checker. It measures from 5.0 nF to 5.0 µF, with 1% accuracy. (If we need to measure a cap greater than 5.0 µF, the folks at Fluke include a section in the manual that tells us how to estimate these values.)

If we decide to simply call the Fluke 87 a test instrument, taking the frequency counter and cap checker for granted, we still get a great DMM. Its display is back-lit for those dark nights. It calculates minimum, maximum, and average values. The user can define the amount of change that will allow a value to be recognized as a change—1 ms or 1 second.

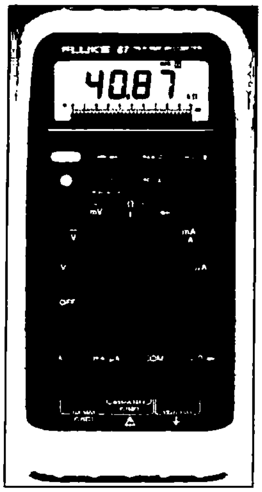


Photo A. The Model 87 digital multimeter.

An "Input Alert" circuit tells you if you plug the leads into the wrong jacks for the function you have selected. A REL mode lets you take readings relative to a set value—or to zero out test lead effects when making sensitive measurements. Diode test. Continuity tone. The list of standard features goes on. In addition, various power-up features let you define parameters for specific measuring jobs—high input impedance on the low voltage range, MIN-MAX recording speed, 4½ digit display, disable beeper or auto-power off.

The Only Drawback

The Fluke Model 87 is truly a splendid instrument, and is destined to become the next "one on every bench" multimeter. It does have one small drawback, however.

The unit does so many different things that it may be difficult to remember some of the operations unless they are used often. Keep the manual handy.

If Fluke can produce a meter like this only a few short years after developing the Model 77, what will they have if I wait a year or two? Maybe a built-in o'scope, logic analyzer, signal generator, with a soldering iron that pops out the back. . . Hmmm. . .

Larry Antonuk WB9RRT has written numerous reviews on test equipment and electronics books. He currently works as a project manager for a land mobile service shop in Keene, New Hampshire. He enjoys home-brew projects, experimentation, and instrumentation. Contact him at P.O. Box 452, Marlborough NH 03455.

QRP

Low Power Operation

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

VFO Design

Last month we talked about the ins and outs of VFO construction. This month we'll look at building a small VFO and some more details on good VFO construction. In QRP operation, the most common practice is to run the VFO at the same frequency as the transmitter. For this reason, we must have a stable VFO. Of course, you need a stable VFO at any frequency.

If you use some of the tips in last month's column, you should be on your way to a good rock-solid VFO. But if you don't have a well-filtered, regulated supply voltage, your efforts may be in vain. In most VFO circuits a simple zener diode regulator has become standard design. If you plan to use a VFO for a simple direct conversion transceiver, throw out the zener diode and replace it with a three-terminal regulator. Why? Some zener diodes are very noisy when they conduct (regulate). This noise can be picked up by the high-gain audio chain of the receiver and passed along to you, as white noise which can sometimes mask weak signals.

Because current requirements are low, you can use a 78L09 regulator. The 78L09 is in a TO-92 case, the same size as most of the newer plastic transistors.

While you're at it, regulate the VFO's buffer stages, too. The 78L09 can handle up to 200 milliamperes. This will keep the VFO from being pulled by the buffer stages, exactly the opposite of their intended duty.

The VFO I use in most of my projects comes from a old issue of *Ham Radio* magazine, December 1971, to be exact. The VFO was designed by Donald Nesbitt K4BGF. I've used this VFO for both direct conversion receivers and stand-alone transmitters. It is stable, easy to build, and quite compact. You can build a circuit board for this VFO. I don't know of a source for boards at this time.

Easy Circuit

The circuit is of a Seiler oscillator. See the figure for details. The circuit uses common parts. No one should have trouble getting this VFO to work.

Looking at the schematic, Q1 is the oscillator with Q2 and Q3 buffers/amplifiers. Notice the use of two separate capacitors for C3. This splits the RF currents, reducing internal heating of the components. C1 is the main tuning capacitor. Try to get a good quality unit. Of course, the old double-bearing jobs would be great, but let's face it. You just can't find them! A cheap capacitor will turn around and bite you.

Construction should begin with a circuit board or perfboard. If you use a PC board, be sure you don't use double-sided board. As I mentioned above, you can remove the zener diode and use a three-terminal regulator. This is what I've done in the past, and I've had no problem with stability. Mount the regulator away from the VFO. You sure don't want the heat from the regulator to influence the VFO's circuitry.

Although 2N2819s are called for in the VFO, I've used MPF102s and find they work quite well. You must remember to switch the leads on the MPF102 if you decide to use a PC board, since the lead-outs are different from the 2N3819s. Someone may also point out that the MPF102 is a bit noisy for a FET. I haven't had a problem using them with this circuit.

Toroid coils are used for L1. Be sure to use the core as specified. Others may not give you the desired results. Of course, you don't have to use a toroid core. I've used slug-tuned inductors and even mini-coils. If you use a slug-tuned inductor, be sure to mount the inductor very carefully. You don't want it moving about and causing instability in the VFO.

The various RF chokes with values as low as a few microhenries have been tried at RFC1 with success. Don't be afraid to try your hand at substitutions.

I placed the toroid core in boiling water for ten minutes to anneal the wire, which improves stability. For those of us who diet, there are only 35 calories in a boiled toroid. They're also fat and cholesterol free!

Testing the VFO

After you have assembled the VFO, test it by first applying voltage to the circuit and confirming 10 volts at the collector of Q3. Using a frequency counter, couple the output of the VFO to the counter. You can also use a general coverage receiver to find the output of the VFO. Take it from me, the counter is much faster. Place C2 about mid-range. Read the frequency of the VFO. If you used a toroid for L1, spread or compress the turns until the desired frequency is obtained. C2 sets the band edges of the VFO. If you can't get the VFO to tune the desired frequency, you may have to add or remove turns from the core. The more turns, the lower the frequency. If the frequency is too high, you can add more capacitance to the tuned circuits by paralleling a small value capacitor across C3. This will lower the frequency. Remember to use only high-quality capacitors in this circuit, such as NPO ceramic, polystyrene, and even silver mica capacitors.

If the VFO does not work, move back toward the oscillator and Q1. A good place to pick up a signal is from the gate of Q2. Avoid loading down the oscillator.

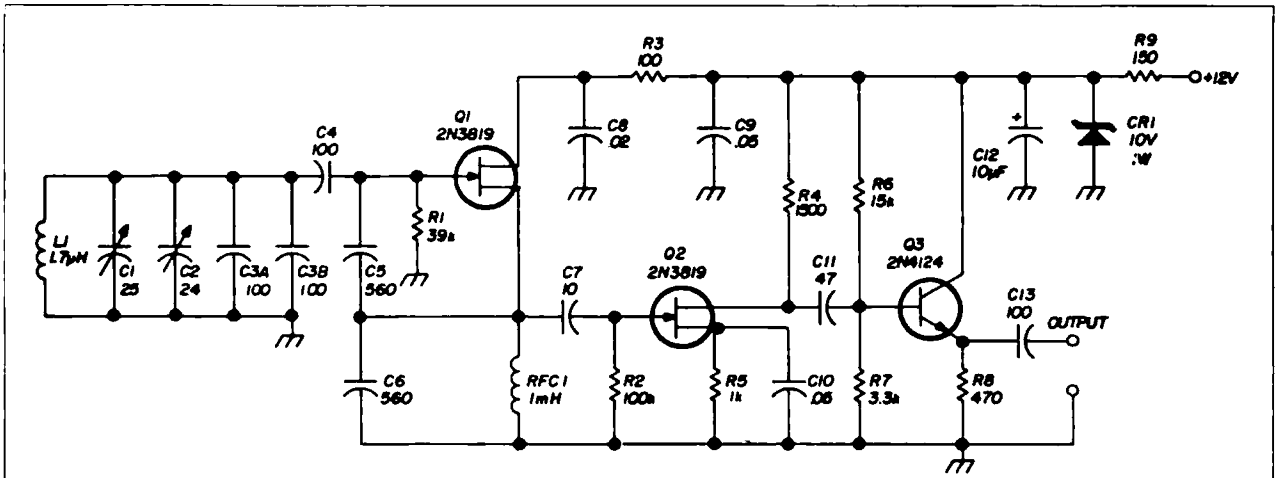
The VFO works, and works quite well. I know you'll find a good home for it in one of your projects. After you're happy with the results, apply some Q-dope to the coils. If you can't get your hands on Q-dope, RTV sealer works quite well. It is messy to work with, smells, and is hard to remove, but it works really great for VFOs.

Don't forget to place the VFO in a shielded box. This is most inportant for stable operation.

If you would like a reprint of the original article, drop me a buck for postage and copying costs, and I'll send you one. I don't have the space this month to reprint the artwork.

One more thing before I go. Don't forget to give those antennas a good fix before the frost gets too thick on the pumpkins. Clean the connectors and install new coax if needed. Remember, coax does not last a lifetime. This is especially true if you've been using cheap coax to begin with. When running QRP, using cheap coax will always come back to bite you, too! Use a coax sealer to keep water out of the connector. When replacing SO-239 connectors, don't use cheap imported jobs, they're too lossy.

As always, this is your column. Questions, comments and your favorite circuits and/or photos are most welcome. If the bands are dead, and you have a modem and computer, check out the QRP SIG on the 73 BBS at (603) 525-4438, (300-2400 bps) 8 data bits, no parity, one stop bit. You can also reach me via CompuServe at ID# 73357,222. Until next month, when you turn it on, turn it down.



C1	25-pF variable (Millen MK21025)
C2	2.4-24.5 pF (Johnson 189-509-5)
C3	200 pF silver mica (total of C3A and C3B)
L1	1.7 µH, 18 turns no. 20 enameled evenly spaced on Amidon T-68-2 toroid core

Seiler oscillator circuit. Component values shown tune from 7.0 to 7.3 MHz. (From Ham Radio, *December 1971.)*

Measure inductance and resonant frequency.

by Michael A. Covington N4TMI

How do you test a coil? Usually, you want to know two things: the inductance and the frequency at which it will resonate with a particular capacitor. This handy tester helps you find both. Connect it to any LC tuned circuit, and it oscillates at the resonant frequency, from below 20 kHz to above 20 MHz. What's more, at the flip of a switch, you can use the built-in 150 pF capacitor to make a tuned circuit out of any coil and deduce the inductance from the frequency at which it resonates.

You can read the frequency on a frequency counter, calibrated oscilloscope, grid dip meter, or communications receiver. From the frequency, you can find the inductance with the accompanying nomograph or computer program. The tester works with coils over a million-to-one inductance range—from 0.2 µH to 0.2 H or more.

The Search for the Circuit

For years I had been looking for an oscillator controlled by a single parallel tuned circuit. The Hartley and Colpitts circuits won't do because they require, respectively, a tapped coil and a "tapped" (double) capacitor. The Clapp circuit uses a single coil and capacitor, but they're in series. That's not good enough. I wanted an oscillator that would take a *parallel* tuned circuit so I could measure the resonant frequencies of IF transformers and other ready-made tuned circuits. Also, every coil has a self-resonant frequency at which it is parallel-resonant with its own internal capacitance; only a parallel-tuned oscillator will test this directly.

The circuit in Figure 1 does the job. It's adapted from a cathode-coupled oscillator described by F.C. Alexander, Jr. in the September 1946 issue of *QST*, pages 69–70, who credits it to F. Butler. Mr. Alexander reported that the oscillator would really take abuse; he found it would still oscillate at 10 MHz with a 6J6 tube with four volts on the filament and a mere *3 volts* (instead of the usual 300) for the plate supply. The FET version was first described by L.F. Heller in *Wireless World*, September 1969, page 409, but he used an RF choke instead of my resistor R1.

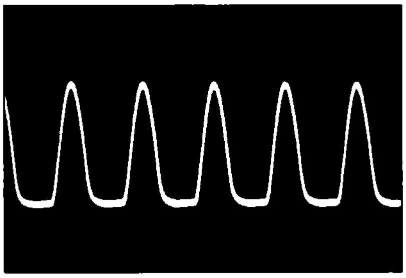


Photo A. The output waveform consists of half-sine-waves and is rich in harmonics.

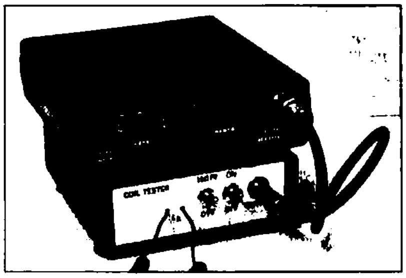


Photo B. The oscillator is housed in an instrument case. Labeling is done with dry transfer lettering on Contact™ self-adhesive plastic. A frequency counter provides the most convenient readout, but you can also use an oscilloscope, dip meter, or communications receiver.

Understanding the Circuit

Think of Q1 as a source follower and Q2 as a common-gate amplifier. The two stages communicate by sharing source resistor R2. Positive feedback goes through C2, and the tuned circuit ensures that the feedback is only effective at the resonant frequency.

The high supply voltage (18 volts) helps extend the frequency range and improves the performance with low-Q tuned circuits. The oscillator won't work with a crystal, but it will sometimes oscillate with a resistor in place of the coil.

The output, rich in harmonics, is taken across R2 (Photo A). R3 provides some output isolation; without it, a capacitive load—such as the internal capacitance of a long cable—could sometimes stop the oscillation.

Construction

I built the oscillator on perfboard and housed it in a Radio Shack instrument case (Photos B and C). The layout is not critical as long as all leads are kept short. Even the test leads should be short—just long enough to reach out of the enclosure—because their inductance is part of the tuned circuit.

Switch S1 is also part of the tuned circuit;

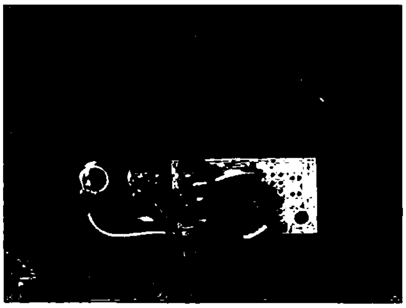


Photo C. Circuit is built on perfboard. Keep all leads short.

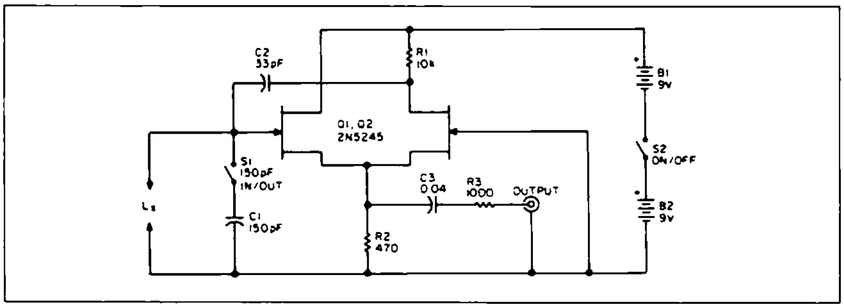


Figure 1. C1 and Lx control the frequency of this source-coupled FET oscillator. S1 removes C1 from the circuit to enable testing of tuned circuits or self-resonant coils.

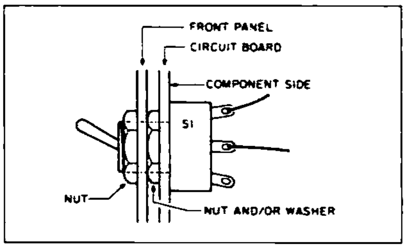


Figure 2. To keep leads short, S1 mounts in a hole in the circuit board.

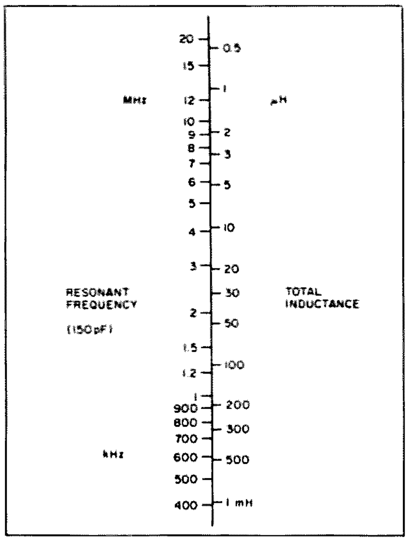


Figure 3. Nomograph to find inductance of a small coil from a single frequency reading. Inductances up to 0.1 H can be measured by taking two readings (with and without the 150 pF capacitor) and doing calculation.

```
100 CLS
110 PRINT "COILTEST BAS -- M. Covington 1989"
120 ' For measuring inductance with test oscillator
130 PRINT
140 ' --- Constants ---
150 PI = 3.14159
160 LS = 0              ' Stray inductance, in H, if known
170 CS = 0              ' Stray capacitance, in F, if known
180 CT = 150E-12        ' Switchable capacitor = 150 pF
190 ' --- Get input from user ---
200 PRINT "Frequency with capacitor (MHz)";
210 INPUT F2
220 F2 = F2 * 1E6   ' convert MHz to Hz
230 PRINT "Frequency without capacitor (MHz, 0 if no osc.)";
240 INPUT F1
250 F1 = F1 * 1E6   ' convert MHz to Hz
260 PRINT
270 ' --- Calculations ---
280 IF F1 = 0 THEN CD = 0 ELSE CD = CT / ((F1 / F2) ^ 2 - 1)
290 L = (1 / (2 * PI * F2 * SQR(CD + CT))) ^ 2 - LS
300 PRINT "Inductance (µH)", L * 1E6
310 IF CD = 0 THEN 340
320 PRINT "Distrib. capacitance (pF)", (CD - CS) * 1E+12
330 ' --- Table of resonant frequencies ---
340 PRINT
350 PRINT "Resonant frequencies with this coil"
360 PRINT "C (pF)", "F (MHz)"
370 FOR I = 1 TO 9
380 C = 1E-12 * 2^I
390 F = 1 / (2 * PI * SQR(L * C))
400 PRINT C*1E12, F*1E-6
410 NEXT I
```

Figure 4. This program finds inductance and distributed capacitance from frequency measurements. It was developed on an IBM PC but should run in practically any version of BASIC.

to save lead length, I mounted it through a hole in the circuit board, and the switch itself attaches the circuit board to the front panel (Figure 2). The batteries are held by clips mounted on the back panel (Photo D); the clips are lined with vinyl tape to keep the batteries from slipping out.

Measuring Resonant Frequency

The simplest way to read out the frequency of oscillation is to use a frequency counter (Photo B). Make sure the reading is stable and is the same with the counter set on more than one range. You can also measure frequency with a calibrated oscilloscope:

Frequency (MHz) = 1 / Length of one cycle (microseconds)

Don't strive for great accuracy; because of stray capacitances and inductances, your results are bound to be off by a few percent.

You can also determine the frequency by tuning in the oscillator on a communications receiver. No physical connection is needed; just place the receiver close to the coil and look for an unmodulated carrier. When you find it, also try one-half, one-third, and one-fifth of that frequency to determine whether you initially heard a harmonic.

Or you can use the ham's traditional tool, a grid dip meter. To do this, start up the test oscillator, then use the dip meter as a field strength indicator. That is, set its gain so that it does not oscillate, and place its coil right next to the coil under test. Tune across the band until you get a slight but sharp peak in the meter reading. This is more accurate and more sensitive than testing a tuned circuit with the dip meter by itself.

What's the Inductance?

To find the inductance of a small RF coil, measure the frequency of oscillation with C1 in the circuit. You can then find the inductance with the nomograph in Figure 3. In fact, you may want to stick a copy of the nomograph to the top of the test oscillator.

The nomograph works as long as you're dealing with a coil whose internally distributed capacitance is small. Any coil with more than 50 turns is likely to have appreciable distributed capacitance. Fortunately, you have an easy way of measuring this, too—just read the resonant frequency with C1 out of the circuit as well as in it. Then use the BASIC computer program in Figure 4 to do the calculations, or work through the formulas from the program on your calculator.

The program was written on an IBM PC but should run in practically any version of BASIC. It finds the inductance and distributed capacitance, then prints a table of resonant frequencies and the capacitances needed to obtain them (Figure 5). That's helpful because usually, hams don't really want to know inductance for its own sake; they want

```
COILTEST BAS -- M. Covington 1989

Frequency with capacitor (MHz) ? 0.58
Frequency without capacitor (MHz, 0 if no osc.) ? 1.77

Inductance (µH)                448.0886
Distrib. capacitance (pF)      18.04398

Resonant frequencies with this coil
C (pF)          F (MHz)
 2               5.316484
 4               3.759322
 8               2.658242
 16              1.879661
 32              1.329121
 64               .9398304
 128              .6645605
 256              .4699152
 512              .3322802
```

Figure 5. Sample output from the computer program. These data are from a coil labeled 470 μH, 5%.

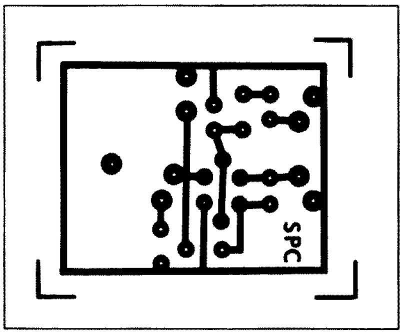


Figure 6. Foil diagram.

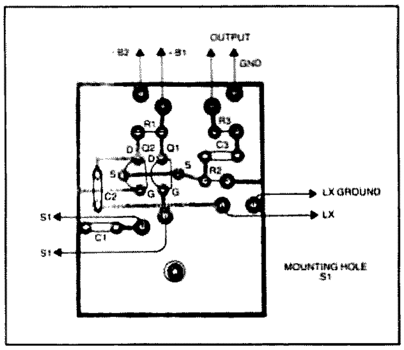


Figure 7. Parts placement.

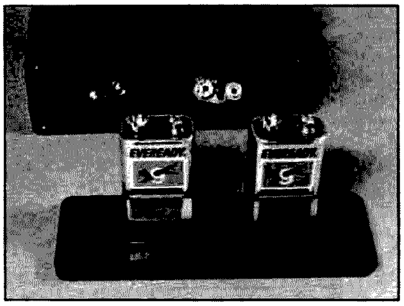


Photo D. Batteries are held by clips on the back panel. Line clips with vinyl tape to keep batteries from slipping out.

to make a resonant circuit for a particular frequency.

If you test an IF transformer, you'll get an inductance and a distributed capacitance that includes the built-in capacitor. For instance, a 10.7 MHz IF transformer that I tested came out as 3.6 μH in parallel with 60 pF, and according to the table displayed by the program, it will tune 40 meters if I add slightly more than 128 pF.

Improving Accuracy

You'll notice that the program has variables for the stray inductance (LS) and stray capacitance (LC) of your setup, in henries and farads respectively. In the program as shown, they are set to zero, but you can gain additional accuracy by measuring or estimating them and putting them into the program.

Stray capacitance is hard to measure and is fairly unimportant, since the 150 pF capacitor completely swamps it. As a ballpark estimate, try 1 pF, which you would enter into the program as CS = 1E−12 (i.e., 1 x 10^{-12} farads).

Stray inductance is more important. It's likely to be about 0.2 μH. To measure it, wind three or four turns of solid hookup wire into a small coil, then measure the resonant frequency with C1 in the circuit. You'll probably get something like 20 MHz. Now spread out or unwind the coil to make the frequency rise. You'll get a maximum frequency around 25 MHz before oscillation stops. Put this frequency into the computer program, and you'll get back a fair approximation to the stray inductance of your setup. Now modify the computer program to make this number the value of LS (for example, if it's 0.2 μH, make LS = 0.2E−6).

By the way, this is not the highest frequency at which you'll ever see oscillation. A high Q tuned circuit can override the low Q stray inductance and make the oscillator run as high as 120 MHz.

An Essential Tool

Two weeks ago I didn't know an oscillator like this could be built. Now I don't know how I'd get along without it. The ability to measure inductance and resonant frequency is so fundamental to RF circuit design that an instrument like this belongs in every ham shack. 73

Michael Covington N4TMI does research in computational linguistics. In his spare time he works 40 and 15 meter QRP CW, builds gadgets, programs IBM PCs, looks at the stars, and writes. He is the author of Astrophotography for the Amateur, *and co-author of* Prolog Programming in Depth *and* Dictionary of Computer Terms. *You may reach him at Artificial Intelligence Programs, University of Georgia, Athens GA 30602.*

Parts list

B1, B2	9-volt radio battery	RS #23-464
C1	150 pF, 50V	5% polystyrene preferred
C2	33 pF, 20%, 50V	ceramic disc
(When using Radio Snack parts, buy two each 100 pF and 47 pF. For 150 pF use 100 and 47 pF in parallel. For 33 pF use 100 and 47 pF in series.)		
C3	0.04, 0.047, or 0.05 µF, −20%/+80%, 50V	RS #272-134
Q1, Q2	2N5245 or 2N3819 FET	RS #276-2035
R1	10 kΩ, at least ¼-W	RS #271-1335
R2	470Ω, at least ¼-W	RS #271-1317
R3	1k, at least ¼-W	RS #271-1321
S1, S2	subminiature SPST or SPDT switch	RS #275-624
2 battery connectors		RS #270-325
2 clips to hold batteries		RS #270-326
RCA-type phono jack		RS #274-346
Test clips		RS #270-336
Perfboard, wire, misc. hardware and labeling		

Note: A blank PC Board is available for $4 ppd. and a kit of all parts except the enclosure and batteries is available for $15 ppd. from Chris Hethorn KM8X at Small Parts Center, 6818 Meese Dr., Lansing, MI 48911. Phone (517) 882-6447

73 Review

by Bill Clarke WA4BLC

Ameritron AL-82 Linear Amplifier

Trouble-free power.

Ameritron
2375 Dorr St., Suite F
Toledo OH 43607
(419) 531-3024
Price Class: $2000

The amateur radio market of today offers many high-power HF linear amplifiers. Some are capable of full power (1500 watts out) and others offer about half that. Some of these amplifiers offer features such as automatic tuning, exotic (read: expensive) tubes, and/or complex operation monitoring and protection circuits.

When dealing with linear amplifiers I am impressed with simplicity, ruggedness, and ease of operation. Amplifiers that use microprocessing and exotic tubes hold little interest for me, as I am always in fear of possible later problems from the complexities involved and the expense of service.

Ameritron's AL-82 has given me what I want. The RF deck consists of two Eimac 3-500Z tubes and the associated components to get the power safely out on the proper frequency. Nothing more!

The Boxes Arrive

There were three boxes in all. Ameritron ships the amplifier in a box without the HV plate transformer or tubes installed (to prevent possible damage from rough handling during shipment). The latter items are shipped separately in other boxes. Everything is very well packed and not likely to be damaged in transit.

I removed the amplifier from its box, then got the tubes and transformer out of their boxes. Out of curiosity, I weighed the transformer. A full 32 pounds of Peter W. Dahl Hypersil quality! Weight is how quality is measured in transformers and power supplies, isn't it?

Inside the Case

Carefully following the AL-82's instruction manual, I installed the transformer, tubes and chimneys. All went well except for an incorrect connector on one of the transformer's primary leads. I replaced this, then continued making the necessary connections. I would have appreciated an extra half inch of secondary leads—what was there was barely adequate.

While the case was open I closely examined each component and the power supply circuit boards. The boards are Fiberglas™ with very accurate and smooth circuit traces. This is an important point, as HV power supply PCBs are a weak point on some amplifiers I have used and serviced in the past. Sloppy circuit boards cause shorts and/or arc-over points, which in turn cause the amplifier to fail, triggering acute operator anxiety and frustration, particularly when sparks fly and smoke comes out of the unit.

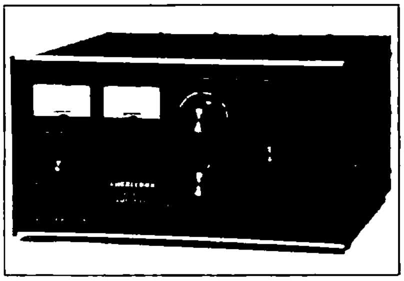


Photo A. Front panel of the AL-82, showing the dual meters and controls.

I was impressed by the quality of the components and the mechanical installation of the various parts. Nothing was loose and all the solder work looked good. The cooling fan is in a cast metal case and the tubes have chimneys over them. No overheating should occur.

Interestingly, a check with the Ameritron factory in Toledo, Ohio, revealed that the power supply and RF deck of the AL-82 is the same as that of the AL-1200 (using the 3CX1200A7 tube) and AL-1500 (using the 3CX1500/8877 tube) amplifiers.

General Features

The AL-82 has two large meters: one for grid current; the other a multimeter for plate voltage, plate current, peak RF output watts and ALC. The grid current meter gives the quickest indication that all is OK when monitoring amplifier operation. Having this meter constantly available for monitoring is an excellent idea.

The plate tune and plate load controls both have very smooth-operating 6:1 reduction drives.

The Eimac 3-500Z tubes are fast to start up, requiring only a few seconds for warm-up (no timer or delay circuits). They are also comparatively inexpensive when it comes time for replacement (which should be a long time away).

Two bias settings are provided to allow optimum performance on CW and SSB.

An operate/standby switch allows barefoot operation without turning the amplifier off.

A red LED indicates on-the-air (key-down). 12 VDC at 100 mA is available on the rear panel.

As an optional feature Ameritron provides a very fast pin diode RF switch for its full line of large amplifiers. Called the PIN-5 OSK Switch, it is perfect for AMTOR and QSK. You can have the factory install it before shipping the amplifier, or you can buy and install it later.

Operation

First and foremost, you must have adequate AC power to operate this or any other full power amplifier. I use #10 copper wire from the breaker box to a single outlet, and the amplifier is the only appliance using the circuit. This provides adequate amperage and prevents voltage drops.

I placed the amplifier in a position to provide adequate cooling and hooked it up to my station ground. I used my trusty ICOM 751-A as a driver during the tests, providing more than enough excitation. I also placed a monitor scope in line to ensure that I was not over-driving the amplifier or flat-topping, and to view the CW waveform.

Using all new RG-213 for interconnections, I brought the AL-82 on line and tuned it up on 75 meters. Everything went well and there wasn't any smoke. I was amazed at the quiet operation of the amplifier and experienced no objectionable fan noise—the computer I am using to produce this text is far noisier than the amp. No doubt this is due to that fine imported German fan.

I followed the tune-up directions and everything went smoothly. All meter readings came up as described in the manual. Using a Bird wattmeter, I watched the power output and compared it to that of the AL-82's power meter. There were some slight variations, but in general the panel meter was quite accurate. Remember, the meter is peak reading, so you will see a good indication of your output power.

I connected to the ALC line and made the necessary adjustment to maintain full legal power output. The amplifier is capable of slightly more than 1500 watts. But, as you will learn in the discussion of the law of decibels later in this article, you will really gain nothing from running over the legal limit, and you could damage the amplifier!

While using the AL-82 I monitored the meters and noted no discrepancies. The HV me-

Photo B. Note the Peter Dahl Hypersil transformer, the heart of this beefy amplifier.

ter showed 3700 volts during idle and 3500 volts during key-down. That indicates a hefty and well-regulated power supply.

Contacts were made on 160 through 15 meters, providing me with an opportunity to see what the amplifier could do on each band. Typical changes in S-meter readings at receiving stations varied from 10 to 20 dB increase in signal strength over my barefoot signal. On several occasions I was told I was not heard when I switched the AL-82 to standby and went barefoot.

No complaints were heard about flat-topping, but I did get a few comments from stations operating on adjacent frequencies. They were sometimes less than courteous in referring to QRM. This is why you should only use the minimum power necessary to maintain contact, keep the input signal as clean as possible, and have regard for your fellow hams.

There were no reports of objectionable fan noise. This point is important, as many amplifiers are noisy in operation to the point of fan sounds getting into the mike.

CW operation went as expected, although I wasn't able to test the optional PIN-5 QSK switch (not installed on this unit). The scope patterns were a mirror of the exciter running barefoot and the power output was typically 1400 watts. For the CW operator using full break-in, I think the QSK option would really be nice.

When using an amplifier such as the AL-82 you must recognize the potential of its full power—the 1500 watts output. This is a significant point, as some amplifiers using the same tube complement are unable to provide this level of output due to weak power supplies.

Opening the unit for periodic maintenance (cleaning out accumulated dust) will be quick, easy, and safe—"safe" providing you read and heed the instructions about high voltage shock potential. Remember, at the voltages found in the AL-82 (and all similar amplifiers) one wrong move and you will be remembered on the bands as: "Too bad about old what's-his-name. Got fried, ya know."

Consideration

Part 97 of the rules requires us to make our contacts using the least power that will provide reliable communications. You don't need to run a full 1500 watts out to talk into the next county. Be considerate of other hams.

Good Points

I like being able to turn the amplifier on and have instant power. The exotic tubes used in some amplifiers require as much as three minutes warm-up time.

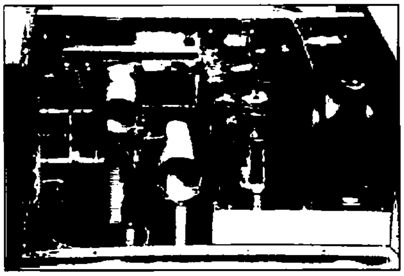


Photo C. The RF deck has silver plated components. To the right of the tubes you can see the cast metal case fan that forces air through the tube chimneys.

The vernier tuning controls are very smooth turning and let you make precise settings.

3-500Z tubes are very economical (when the need arises).

The cooling fan is very quiet.

The separate grid meter is great.

Inrush filament current limiting is provided to protect the tubes at turn-on.

The Ameritron warranty covers the amplifier for one year (except the tubes, which are warranted by Eimac).

Recommendations

I think the band selector switch should be labeled with all the WARC bands (only 17 meters is included as in 15/17) and 10 meters should be labeled as such, not as AUX. Most hams will make the modification anyway.

It is unfortunate that licensed amateurs must make modifications to an amplifier to allow use on 10 meters. Such is the state of affairs in this country—punish the masses for the infractions of the few.

The little red LED that indicates key-down is insignificant. It should have been larger.

Is It For You?

Would I recommend the AL-82? An emphatic "yes" to those requiring a rugged and trouble-free full power amplifier. This amplifier is constructed like the typical battleship and should provide thousands of carefree hours of operation. However, I want to point out that all amplifiers of this type do have drawbacks and are not for everyone.

They are very large, heavy and expensive. Consider this before purchasing one. Also, remember that you may have to do some electrical work in order to provide the necessary 240 VAC a full-power amplifier requires for operation. You must use heavy coax, such as RG-8 or RG-213, when operating at high power. No more RG-8X or RG-58.

The Law of Decibels

In understanding what a linear amplifier can do for you, consider the following: It is generally recognized that there is a 3 dB increase in received signal strength for every doubling of transmitted power. This equates to the signal of a 100 watt exciter being raised approximately 12 dB when amplified to the 1500 watt level.

Once again, it's not necessary to run this amplifier at full power for reliable communications. The difference between 800 watts and 1500 watts is about 3 dB, a small difference at the receiving end. However, it's good to know that the AL-82 can give you that extra boost whenever you need it. ■

Manufacturer's Specifications

Input
- Circuit type: Pi-network, slug tuned coils
- Maximum VSWR at resonance: 1.2:1
- Minimum 2:1 VSWR bandwidth: 20%
- Maximum drive power permissible: 130 watts
- Typical drive for full power output: 100 watts

Output
- Circuit type: Pi-L, Pi
- Half-hour continuous carrier: 1500 watts (below 18 MHz)
- 30-second continuous carrier: 1800 watts plus
- Half-hour PEP two-tone test: 1800 watts
- 30-second PEP two-tone test: 1800 watts plus

Power Supply
- Circuit type: full wave bridge, capacitor input
- No load voltage: 3600 V
- Full load voltage: 3300 V
- Full load current: 0.8 amp
- Regulation: 10% or better
- Transformer: Hypersil
- Capacitors: 26 µF total, computer grade
- Maximum draw at rated output: 13 amps at 240 VAC

Tubes
- 2 3-500Z
- Continuous dissipation : 1000 watts
- Warm-up time: 5 seconds

Metering
- Multimeter: HV, IP, RF Out, ALC
- Grid: grid current

ALC: negative going, 0-20 V (adjustable)

Efficiency (typical)
- CW: 65%
- SSB (envelope crest): 62%

Frequency Coverage
- All ham bands (WARC uses nearest standard band)
- 10 meters available upon request to licensed amateurs

Keying: 12 VDC circuit requires external relay switching to ground

RF Connectors: SO-239s

AC Line Connector: NEMA 6-15P 240V style

Dimensions: 18.5 x 17 x 10 inches (DWH)

Weight: 77 lbs. (with transformer installed)

Third Order IMD: −34 dB at 1500 W output

73 Review

by Phil Nowak KA9KAF

The Weller® Cordless Pyropen™

The Cooper Group
P.O. Box 728
Apex NC 27502
(919) 362-7510

A soldering pencil for both the bench and the field.

Price Class: Self-igniting model (WPA-2), $85; Non-self-igniting model (WSTA-3), $78; Pyropen Junior (WST-2), $62

When I first saw the Weller Cordless Pyropen, I became fascinated by this small soldering pencil. Its attractive design reminded me of an oversized drafting pen. It's the kind of item that has impulse appeal. I could almost hear it saying, "Buy me! Buy me!"

When the Pyropen arrived, I carefully read the instruction sheet supplied with it. The instructions were clear and straightforward.

One of the attractive qualities of this product is that it doesn't need a power cord. It runs on butane gas, just like a cigarette lighter. Unlike my cordless rechargeable soldering iron, this unit will run three to four hours on a gas charge. Recharge time is in seconds instead of hours. It is also electrically neutral; it will not introduce an electrical charge to the item you're soldering.

The unit arrived charged with nitrogen gas. For safety reasons, the manufacturer does not ship them filled with butane gas. You can buy butane gas at your local supermarket or drugstore. I bought some gas, charged the unit, opened the main gas valve, and pushed the ignition button. There was a rush of air, a whistling sound, a three-second countdown, then ignition. When the six small round windows in the housing that holds the soldering tip start to glow orange the Pyropen is on and hot. It heats up in a hurry.

Three Sleek Models

The Pyropen has nice balance in the hand when soldering, and looks like a precision tool. The factory told me this unit was designed in Germany. It has that look and solid feel of Teutonic engineering, like a Mercedes Benz. The factory told me they looked at hundreds of products before selecting this one.

I had noticed three different versions of the cordless Pyropen at Radio Expo. I got the self-igniting model (SI). The second model (NSI) is almost identical except that it is not self-igniting. You light it with matches. The third model is smaller, slightly larger than an old-fashioned fountain pen, and also requires matches to get it going. This smaller Pyropen is called the Pyropen Junior.

The SI model is designed for outdoor use. The ignition area is shielded and the Pyropen can be fired up without matches, even while the wind is blowing. The NSI model is designed for indoor use where wind is not a problem. Its market is primarily for the test bench. The Junior model is more of a traveling technician's tool. It, too, has a protective cap, but it is much smaller and fits in a shirt pocket.

There are functional differences as well. The Junior model has a thirty-minute gas capacity. While all the Pyropens use a catalyst to burn the butane gas with no open flame, the NSI model can be configured to produce an open flame. A device called a torch ejector replaces the soldering ejector (the device which holds the catalyst and burns the gas) and allows the NSI model to function as a brazing torch. This feature is not found on the Junior or SI models. There are lots of interchangeable tips for the SI and NSI models, including hot air nozzles for heat shrink tubing. I liked that feature. The brochure suggests other uses for the hot air such as drying glues and solvent.

Caution: Not only does the tip get hot while the Pyropen is on, all the up-front metal parts get hot as well. There is little mass involved so the unit does cool rapidly once it's turned off. Another caveat: The small ignition wire on the SI model is somewhat delicate. I suggest leaving it alone.

Another nice feature is the temperature adjustment. The brochure says it ranges from 200 to 500 degrees C. This lets you solder delicate components without cooking them. If you need something hotter, just turn up the heat.

It Works!

This review wouldn't be complete without putting the unit to work. I had a few projects sitting on the shelf just waiting to be dusted off. One of these involved some delicate soldering in small spaces. Does this sound familiar? The heat control let me get the job done without cooking everything. I didn't use all the wires on one of the cables I made up. I folded these back along the cable and covered them with heat-shrink tubing. I removed the soldering tip and replaced it with the hot air tip. Even on low heat, the Pyropen did its job. I shut the unit off during lulls in my soldering activity to conserve fuel. That's also a safety feature. Don't leave a hot soldering iron just lying around on the workbench!

Whether you have a soldering iron or not, the Cordless Pyropen makes a handy addition to any workbench or toolbox. You can buy Pyropens in hardware stores, at larger hamfests or directly from The Cooper Group. ■

Contact Phil Nowak KA9KAF c/o Cogito Corporation, 3835 West 56th Place, Chicago IL 60629.

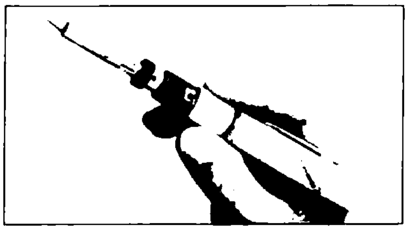


Photo A. The Weller Pyropen Jr.

Number 23 on your Feedback card

ASK KABOOM

The Tech Answer Man

Michael Geier KB1UM
7 Simpson Court
S. Burlington VT 05403

Working Without A Net

If you've been following my column, you know that I always insist that you get the schematic tor anything you need to fix. Working without one is like painting blindfolded. It can be done, but it ain't easy. Unfortunately, there are times when you have no choice.

You've just picked up that unusual rig or piece of test gear with the "unique" name on it from your local hamfest ("Of course it works," they said), only to find it dead on arrival or, at best, gasping its last breath. Naturally, the manufacturer is either out of business or no longer stocks anything, including the manual, for your obsolete find. And if you think this kind of thing only happens with old tube boat anchors, think again. Solid state has been around long enough now that there are plenty of transistorized boat anchors out there, too. (Of course, they anchor your boat just as well, even though they're smaller and run cooler!)

Grab Your Brushes...

So, let's embark upon a discussion regarding repairs without diagrams. Got those blindfolds on? Grab your brushes!

As I've mentioned many times, all electronic devices are designed and built in stages. They all have some kind of power supply, input, signal process and output. When you approach one with no road map, the first, second and third considerations are: SAFETY, SAFETY, AND SAFETY. Look at your machine, rig, or whatever, and ask yourself: Can I get hurt on this thing?

If it's a solid state receiver, probably not. Just stay away from anything connected to the AC line, and you should be fine. The rest of the circuitry is likely to be at low voltage (but see note below). If it's a transmitter, though, you could get quite a jolt from the output stages, should you actually get it to transmit. Under the right circumstances, 100 watts or even 10 watts of RF is enough to injure or kill you. And remember: Anything with tubes is guaranteed to have dangerous voltages. (Note: This can include the fluorescent and neon readout tubes used for frequency displays in receivers. If the readout is orange or blue-green, it is tube-type, and probably driven by semi-dangerous voltages, perhaps in the 40 to 200 range. If it's red or green, it's probably LED, and safe.)

The most dangerous tube circuits are those involving CRTs. Computer monitors, TVs and oscilloscopes fall into this category. The voltages on CRT anodes are *extremely* high, ranging from maybe 2,500 volts for a small oscilloscope to more than 30,000 volts for a color TV. And there's enough current to kill you in short order. So don't mess with this stuff unless you really know what you're doing.

The most dangerous solid state circuits are switching power supplies. Many of their components are tied to the AC line, and can do you in. Although they are not common in radio gear, they are used in nearly all desktop computers and many monitors. If you absolutely *must* try to fix one, do all your testing with the AC line disconnected and the capacitors discharged. *Never* poke around in one of these while it's plugged in—it could be your last poke.

Getting Started

The sequence of the repair job is the same as it is when you have the diagram. The big difference is in recognizing the various circuit stages on sight, and coming up with some good guesses regarding the input and output connections for each stage.

Let's assume that the device to be repaired is a solid state radio with a linear power supply. As always, check first to see if the unit lights up at all. If not, go right to the power supply and check the fuse, if there is one. Naturally, change it if it's blown. If it blows again, you've got a short somewhere.

Follow the transformer output leads to the rectifiers. These will feed the filter caps (which will be large electrolytic types). Next, you should come to a regulator transistor or IC. Most likely, it will be mounted on a decent-sized heat sink. If it is getting very hot, too much current is being drawn through it. Also, it may be damaged.

Follow its output to the end of the supply, and you should wind up at a wire or PC board trace which feeds the rest of the rig. Disconnect it and turn the rig on. If the voltage at the supply's output is now OK, the short is somewhere else in the rig. If it's still dead, or still blows the fuse, something's gone in the supply. It may still have been blown, however, by a short in the rig. In fact, that's likely.

If the rig lights up but behaves wrong, try to eliminate as many stages as you can, right from the start. Obviously, if there's audio of any kind, even just hiss, the speaker and audio amp are OK. If the frequency readout is scrambled but the rig still works, don't waste your time in the IF stages!

OK, so you know all that. But how do you tell the IF from the front end from the transmit amp? The kinds of parts used are often a dead giveaway. Here's a brief rundown of what you're likely to find:

Power supply regulator: Big transistor or IC mounted on a heat sink or screwed to the chassis. Usually round. Look for big filter caps.

VFO: If it's analog, it'll probably be in a big shield. Look underneath the shield for an air-gap tuning capacitor. It should be right behind the main tuning knob. If it's digital (a frequency synthesizer), follow the output of whatever's connected to the tuning knob. It'll probably lead you to a bunch of ICs. Synthesizers are extremely hard to fix without schematics (and not so easy with them, either). Fortunately, the technology is new enough that you can nearly always get the diagram for a synthesized rig. That may not be the case ten years from now.

Local oscillators: Look for crystals and variable inductors. It may be hard to tell these from IF stages. If there are several in a row, that's probably the IF, not the local oscillator. Also, crystals are always in small, flat, metal cans, while their cousins, the IF filters, are usually plastic, or very large.

Receiver front ends: Follow the antenna. If there's a TX/RX relay, it can be hard to follow, but try to trace through the contacts in their resting position. Virtually all relay rigs pull the relay in for TX, and release it for RX. (While you're there, give the relay a good cleaning. In seconds, cleaning can solve many problems in older relay rigs.)

When there's no relay, you will probably find a series of diodes and capacitors splitting the antenna and sending it to both the receiver front end and the transmitter finals. You'll have to follow it both ways to see which is which. Whichever path leads to smaller components is the receiver! Front end parts are small, with tiny coils, and sometimes dual-gate (four-legged) transistors.

Mixers and IFs: Mixers can be hard to find on sight, but should be easy to locate if you have found the front end. Just follow its output, and you're there. Mixers have two inputs, one from the front end and one from the local oscillator or frequency synthesizer. The output leads right to the IFs. These are easy to spot—just look for several can-type adjustable coils in a row.

AGC amps: These are really feedback loops. They are usually made from transistors, and take their inputs from somewhere near the last IF stage. The output goes back to the front end or first IF stage, controlling the receiver's overall gain. A bad AGC amp can make the entire receiver seem weak or broken.

Detectors: In AM rigs, these can be no more than a diode. For FM, an IC or several diodes connected to an IF-type can are common. For SSB, anything from four glass diodes in a bridge rectifier-type arrangement to an IC may be found. In any event, the detector is always at the output of the IF strip, so it should be easy to find. If all else fails, trace the wire coming from the high side (not the center) of the volume control. In multimode rigs, of course, there may be several detectors, with the appropriate one typically selected via some diodes coming from the mode selector switch, or from the digital system, if there is one.

Low-level audio amps: Follow the center lead of the volume control. It should lead directly to the first stage of the audio amp. The amp may be an IC, but it is more likely to be made from discrete transistors.

Squelch circuits: These are usually near the first audio stage, and can be hard to separate from it. Just follow the wires from the squelch control. Most squelch circuits consist of one or two transistors and a few diodes. A dead one can mute the audio amp, making the rig appear more broken than it actually is.

Audio power amps: There is often no clear dividing line between the low-level amp and the power amp, because the audio amp chain typically has a number of stages to build the signal up gradually. Of course, the final stage which drives the speaker can be considered the power amp, and it is usually a push-pull arrangement of some kind. In some rigs, it is a power IC, and may be mounted to the chassis for heat sinking.

Mike amps: Follow the mike lead. There may be several stages, with some AGC-like circuits for compression or level control. Basically, they are much the same as any other low-level audio amps.

Modulators: This is tricky because it depends on the mode (FM, SSB, etc.), and may have many variations even within a given mode. Generally, when the output of the mike amp stops looking like audio circuitry, you've found the modulator! It may be four diodes in a mixer-like arrangement, an IC or even a coil/capacitor (L/C) setup. Like a mixer, it will have two inputs and one output. One input, of course, will be from the mike amp, and the other will be the carrier to be modulated. The output should feed some transmit amps or other mixers.

Well, I seem to be running out of space, so what do you say we continue this next month? Meanwhile, good luck and be careful! A hint: It always takes *much* longer to work without a schematic than it does with one. I guess that's just part of the price you pay for getting a bargain. ■

Hams Around the World

Bob Winn W5KNE
℅ ORZ DX
P.O. Box 832205
Richardson TX 75083

New DXCC Countries?

The DX Advisory Committee (DXAC) has received two more applications for separate country status. The DXAC will consider these applications, then recommend whether they are worthy of being added to the DXCC Countries List. The ARRL Award Committee makes the final decision.

Penguin Islands, South Africa

This application was submitted by Bill KC1AG (who submitted the successful Walvis Bay application), Hans DK9KX and Ian ZS9A.

According to the application, the Penguin Islands are a group of 13 tiny South African guano islands, located along the coast of Namibia, north and south of Luderitz. The islands are located off the restricted diamond area of Namibia. The preferred names for these islands are: Albatross Rocks, Halifax Island, Hollandsbird Island, Ichaboe Island, Mercury Island, North Long Island, Penguin Island, Plum Pudding Island, Pomona Island, Possession Island, Seal Island, Sinclair Island and South Long Island. Of the thirteen islands only Hollandsbird (the northernmost island in the group) and Possession islands are shown on the *National Geographic Atlas of the World*. These islands are administered by the Cape Province.

This application for separate country status is based on the islands being more than 75 miles from the closest point in South Africa (and Walvis Bay). The application is very well done and looks very convincing.

Following immediately after the application for separate country status, DK9KX announced a DXpedition to the Penguin Islands, which was scheduled to begin July 14. The list of operators included: DF9KH, DK9KX, DL8CM, V51DM and ZS9A. The announced callsigns were DL8CM/ZS1 on CW, DK9KX/ZS1 on SSB and ZS9A/1 on 50 MHz. This operation probably took place from Seal Island, which is located just north of Luderitz. The first announcement mentioned a ZS0 prefix, but later information received from DK9KX said they would be operating portable ZS1 instead.

Grosse Ile, Canada

Martin VE2EDK and Dany VE2EBK submitted an application for Grosse Ile, Canada. Grosse Ile is located in the St. Lawrence River near Montmagny, 29 miles downstream from Quebec. The island is shown on road maps.

Their application is based on several factors: separation by foreign land, under the controversial Point 3(b) of the DXCC Countries List Criteria; and an implied relationship with the DXCC countries of Sable Island and St. Paul Island, because all three are under the jurisdiction of the Canadian Federal government and not administered by any province. You may recall that the recently denied application for country status for Tatoosh and Guemes Islands was based on this same Point 3(b) and that the DXAC is considering a rewrite.

7K1-7N1: New Japanese Prefixes

With the availability of "J" prefix callsigns rapidly diminishing in the prefectures of Chiba, Gumma, Ibaraki, Kanagawa, Saitama, Tochigi, Tokyo and Yamanashi, new callsign prefixes have been authorized. The new callsign prefixes for applicants will be 7K1, 7L1, 7M1 and 7N1 (the 7J callsign prefix has been designated for foreign reciprocal licensees). The authorities are already issuing callsigns in the 7K1 series and the other prefixes will follow as use dictates. Thanks to *JARL News*, *The Totem Tabloid* (bulletin of the Western Washington DX Club) and Bob KE7GL.

The Red Sea Islands

As I am writing this month's column, the question of whether or not the Abu Ail Islands will be deleted from the countries list remains unresolved, or at least no action has been taken. The popular opinion is that the islands ceased to be valid for separate country status on March 31, when Yemen took control of the lighthouse, but the *DX News Sheet* thinks otherwise. The following paragraphs, adapted from *DX News Sheet*, provide an interesting argument for retaining the islands on the DXCC countries list and give background information about the Red Sea Islands:

There have been many rumors circulating the DX bands about the status of Abu Ail and Jabal at Tair following the recent DXpedition by the DL operators. Even suggestions that they have already been deleted from the DXCC list!! Here are some excerpts from the official press release about the matter, issued by the United Kingdom Department of Transport on October 16, 1989, which make it clear that such action would be premature:

The UK's resignation as Managing Government of and as a party to the Red Sea Lights Agreement was announced today. The Agreement covers the operation of two navigation lights in the Southern Red Sea, managed by the UK on behalf of the 15 contracting governments.

Following a recent review, most signatory Governments to the Agreement concluded that the lights are no longer needed for their international shipping. The British Government shares this view and accordingly has resigned its position as Managing Government to take effect 31 March 1990. Its withdrawal from the Agreement as a participating Government will take effect from 31 March 1991. If no successor managing Government is appointed by the contracting Governments, the Agreement will lapse before that date.

The position locally has now changed unexpectedly in that the lights administered by the Red Sea Lights Company, which acts as the UK's managing agent, are no longer operating. Other lights are now operating at the same locations, and these are understood to have been put up by the Yemen Arab Republic. Accordingly, the UK has advised other signatory Governments that the lights now operating are not the responsibility of the UK and other signatory Governments of the Red Sea Lights Agreement.

The lights at Jabal at Tair and Abu Ail were among four built by the Ottoman Empire and first exhibited in 1903. Turkey renounced her rights and titles to the islands in the Treaty of Lausanne, and their sovereignty has since remained undetermined. The two lights have been managed by Britain since 1915, when the former Turkish islands were occupied by the Royal Navy during the first World War. For a period in the 1930s Germany, Italy and the Netherlands contributed to the costs of managing the lights, but this ended with the second World War.

The post war international cost sharing agreement was reached in 1962, with Britain taking the role of Managing Government, and is based on participating countries' share of the shipping tonnage through the Suez Canal. In recent years the management of the lights has been undertaken by the Red Sea Lights Company. The contracting Governments under the Agreement are Denmark, China, Egypt, West Germany, Greece, Italy, Kuwait, Liberia, Netherlands, Norway, Pakistan, Sweden, USA, USSR and the UK. The Yemen Arab Republic is not a party to the International Agreement.

Sovereignty over Abu Ail (and Jabal at Tair) is still not determined and is not directly affected by the cessation of the UK interest in the lighthouses. The new lights mentioned in the press release as having been erected by the YAR strengthen any YAR claim to sovereignty, but it is not clear what court or body would validate such a claim (apart from the signatories of the Treaty of Lausanne, who have probably lost interest).

The bottom line is that the islands should continue to count for DXCC until YAR, or one of the other nearby states, makes a claim that is supported internationally." 73

Number 25 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the June issue, we should receive it by March 31. Provide a clear, concise summary of the essential details about your Special Event.

SEP 1-2

KELOWNA, BRITISH COLOMBIA The Okanagan Valley Ham Fair Society will hold a Ham-Fair at Camp Dunlop (150 miles N.W. of Spokane WA) Talk-in 146 92 Penticton, 146 82 Kelowna, 146 88 Vernon Contact *Orin Beebe VE7BEE, Box 477, Penticton B.C. V2A 6K6, Canada* or *Doug McIntyre VE7APS at 764-8637*

ALAMOGORDO, NM The Alamagordo ARC will hold their Sixth annual Hamfest at the Otero County Fairgrounds Sat. from 8 AM-5PM, and Sun. from 8 AM-2 PM VE Exams. RV parking Free admission Tables $5 per day Pre-registration for door prizes $5 (before Aug. 31), $6 at the door Talk-in 146 20/.80 repeater For info call *(505) 437-0298* or *(505) 437-0992*. For exam info call *"Ole" WA5IPS, (505) 437-5896* Mail registrations to *June K5BHE, PO Box 276, Alamogordo NM 88311*

SEP 2

INDIANAPOLIS, IN Central Indiana Hamfest/Computerfest, brought to you with the help of the Ivy Tech ARC, will be held at the East Pavilion Building at the Indiana State Fairgrounds from 8 AM-4 PM Admission $3 in advance, $4 at the door Accompanied children under 12 free Free parking Booths with tables $10 each Booths without tables $5 each Send reservations before Aug. 15th to *Leo Doyle KE9TS, PO Box 20158, Indianapolis IN 46220* For info call *(317) 251-9833 or (317) 352-0136*

SEP 8

LAPORTE, IN The Laporte ARC and the Michigan City ARC will hold a Hamfest Sat at the Laporte County Fairgrounds. Talk-in 146.52 simplex. Forums include the Midwest Microwave Society's construction exhibit and seminar (bring your SHF projects) Donation is $3.50 Table charge is $3.50. Reserve in advance by SASE to *LPARC, PO Box 30, Laporte IN 46350*

FORT WAYNE, IN The Summit City Hamfest, sponsored by the Fort Wayne Radio Club will be held at the 4-H Fairgrounds on Carroll Rd from 6 AM-3 PM. Free parking. Set-up 6 PM Friday. Advance admission $3, $5 at the door. Tailgating $7. Table/chair/open air building $10 (by reservation) Table/chair/electricity/ enclosed A/C bldg. $15 (by reservation). Talk-in: 146.16/.76, 222.88/224.48, 449.875/444.875 Contact *Frank Jaworski K1FJ, 3923 Oakleaf Dr., Fort Wayne IN 46815. (219) 485-2634*

UNIONTOWN, PA The W3PIE Uniontown ARC, Inc. will hold its 41st annual Gabfest on the old Pittsburgh Rd Free parking Free Swap & Shop set-up with registration Pre-registration $4 each or 2/$5. Talk-in 147.045/.645 and 144/57/145.17 Contact *John T Cermak WB3DOD, PO Box 433, Republic PA 15475 (412) 246-2870 or (412) 246-9383*

SEP 9

BUTLER, PA The Butler County ARA, Inc will sponsor their 13th annual Hamfest at the Butler County Farm Show Grounds at Roe Airport from 9 AM-4 PM. Free outside Flea Market Indoor vendor's space $10 per 8' table. Admission $1, children under 12 free Mobile check-in till noon 146.52 (W3UDX) simplex Directions 147.96/.36 (W3UDX) Overnight Camping Handicap parking Fly-in (Butler-Roe Airport) 122.7 MHz. For info contact *Chairman, PO Box 1787, Butler PA 16003-1787* To reserve indoor table space contact *Joseph Stahlman WA3BVO, Box 8815, R.D. 5, Slippery Rock PA 16057, (412) 794-8383*

FINDLAY, OH The Findlay RC will hold its 48th annual Hamfest at the Hancock County Fairgrounds beginning at 8 AM Advance tickets $4, $5 at the gate Set-up at 6:30 AM Tables are 8' x 32". First table $12 (includes admission for one), additional tables $8. Reserve before Sept 1st. Reserved tables held until 9 AM then resold if unclaimed Talk-in 147.75/.15. Send payment and SASE to *FRC Tables, Box 587, Findlay OH 45839* Make checks payable to Findlay Radio Club For info call *(419) 423-1190*

MONETT, MO The Ozarks ARS will hold its annual Club Congress & Swapfest at the Monett (Missouri) City Park beginning at 9 AM. Bingo at 10 AM. Pot-luck Dinner at 12:30 PM. The park is located at the junction of State Hwy 37 and US Hwy 60. Talk-in: 146.37/.97. Contact *The Ozarks ARS, PO Box 327, Aurora MO 65605, (417) 678-3375.*

JOLIET, IL The Bolingbrook ARS will hold its sixth annual Ham/Computer Fest at the Inwood Recreation Center. Dealer Setup: Sat. 3-6 PM, Sun. 5 AM. Gates open at 6 AM, indoor stadium opens at 8 AM. Advance tickets $3 Reserved dealer tables indoors $10. Reserved flea market tables indoors $5. VE testing. Talk-in: 147.33 +0.6, 224.54 -1.6, 146.82 -0.6 MHz. For info call the BARS Hotline *708) 759-7005*. For advance ticket reservations mail check to *Bolingbrook ARS, PO Box 1429, Bolingbrook IL 60439-7429.* For table reservations contact *Ed Weinstein WD9AYR, 7511 Walnut Ave., Woodridge IL 60517. (708) 985-0527.*

WEST HARTFORD, CT The University of Hartford Computer Fair will be held from 10 AM-4 PM at Sport Center. Admission $5. Contact *Cogan, One Magnolia Hill, West Hartford CT 06117. (203) 233-9922.*

SEP 14-16

VIRGINIA BEACH, VA The Assoc. of North American Radio Clubs' convention will be held at the Virginia Beach Pavilion, in conjunction with the Tidewater Radio Convention's 15th annual Hamfest/Computer Show. WNIS-AM, Newsradio 850, is the convention sponsor. The Old Dominion DX Assoc. is coordinating the convention. For info contact *ANARCON '90, Box 9645, Norfolk VA 23505-0645.* Telephone ANARC at *(804) 499-1191* or *(804) 877-4969.*

SEP 15

CALGARY, ALBERTA CANADA The Sixth annual Calgary Ham Radio Flea Market will be sponsored by the NOVATEL ARC at the Parkhill Community Centre from 0900-1300. Admission $2. Tables $2. Talk-in: VE6NRC 146.76; simplex 146.52. To reserve a table, send your name, callsign and $2 to *NOVATEL ARC, 1020 64th Ave. N.E., Calgary Alberta T2E 7V8, Canada.*

CAMBRIDGE, MA TailgateElectronics/Computer/Amateur Radio flea market sponsored by the MIT Radio Society and the MIT Electronics Research Society, will be held from 9 AM-2 PM at Albany and Main St. Admission $1.50. Free off street parking. Tailgate room. Sellers $5 per space in advance, $8 at the gate. Includes 1 admission. Set-up 7 AM. For reservations call *(617) 253-3776.* Mail advance reservations before the 5th to *W1GSL, PO Box 82 MIT BR, Cambridge MA 02139.* Talk-in: 146.52, 449.725/444.725—pl 2A—W1XM/R.

SEP 15-16

PEORIA, IL Hamfest/Computer Fair, ARRL Illinois State Convention, sponsored by Peoria Area ARC at the Exposition Gardens. Flea Market from 6 AM-6 PM. Camping and free parking. Banquet at 7 PM Sat. night by reservation. Admission ticket good both days. $4 advance, $5 at the gate. Advance sales close Sept. 13th. Enclose SASE, and make check payable to *Peoria Area ARC, PO Box 3461, Peoria IL 61614.* Talk-in: 146.76/.16.

VIRGINIA BEACH, VA The Tidewater Radio Conventions, Inc. will hold the ARRL Roanoke Division Convention and the ANARC 1990 SWL Convention at the Virginia Beach Pavilion from 9 AM-5 PM. Admission $5 in advance, $6 at the door. Talk-in: 146.970/-300. Contact *Manny Steiner K4DOR, 3512 Olympia Lane, Virginia Beach VA 23452. (804) 340-6105.*

SEP 16

PENNSAUKEN, NJ The South Jersey RA will hold its annual Hamfest at the Pennsauken High School. Gates open at 8 AM. VE Exam registration is at 9:30. Tickets are $3.50 in advance, $4 at the door. Vendor tickets are $5 per table plus the cost of admission. Talk-in: 145.29/144.69 K2AA repeater. For info and tickets contact *Jim McGrath KB2IYS, 2 Dickens Lane, Mt. Laurel NJ 08054* or *(609) 866-0890* after 6 PM EDT.

OLD WESTBURY, NY The Long Island Mobile ARC will hold a Hamfest at the New York Inst. of Tech. from 9 AM-4 PM. Admission $5 at the gate. Exhibitors $8. Talk-in: 146.25/.85. Contact *Neil Hartman WE2V, (516) 462-6549* or *Mark Nadel NK2T, (516) 796-2366.*

Near CONCORD, NH, off Interstate 89 The Contoocook Vally RC is sponsoring its Fall Ham Radio/Electronic Flea Market 14 miles from Concord NH. Sellers set-up at 8 AM, cost is $5. Buyers arrive anytime, cost $1. Contact *Dave K1OPO at: WA1WOK-2/BBSWOK, or (603) 746-5090.*

CANFIELD, OH The 20/9 ARC will sponsor a Flea Market at the Mahoning County Joint Vocational School from 9 AM-4 PM. Set-up at 6:30 AM. $1 per space. Dealer tables $6 per 8'. Admission $2 at the gate. Handicapped accessible. VE Exams at 1 PM. Talk-in: Mobile check in until 1 PM on 147.315 and 145.270. Reserve in advance by contacting *Paul Resch, (216) 793-8352* or *David Spencer, (216) 544-3723.*

VERNON, CT The Hartford Hamfest will be held ½ mile from 184, exit 67. Tables, (bring your own) $8 in advance, $10 at the door. Rent-a-table, reservations only, $15. Tail gate, advance $5, $7 at the door. General admission $3. Dealers 8 AM; public 9 AM. Contact *Phill Davis WF1O, 45 Marshall Rd., Manchester CT 06040. (203) 649-1624 (evenings).* ARRL/VEC exams at 9 AM. Contact *Joe Faraci WD1U, 190 Richmond Rd., Coventry CT 06238. (203) 742-7625 (evenings).*

SEP 21

VERONA, NY The Madison-Onieda ARC holds VE Exams the third Friday of every month at the Madison-Oneida BOCES on Spring Rd. Take I90 to Exit 33, RT 365 North two traffic lights, turning right at the second light. Time is 7 PM. Talk-in on 145.37. Contact *Leonard Popyack WF2V, (315) 853-8974*, or on *146.79, 145.37, WF2V @ WA2TVE, or POPYACK@TOPS20.RADC.AF.MIL.*

SEP 21-23

GAYLORD, MI The Chain of Clubs will be hosting the 1990 ARRL State Convention at the County Fairgrounds. White Fish Fry, Woulf Hong, Fri.; Flea Market, Banquet, Sat.; Church services, VE Exams Sun. Admission: $3 advance, $5 at the door. Commercial vendors: $15 first table, $10 second table. Noncommercial: $5; Tailgate: $3. Talk-in: 147.12+. Reservations for VE Exams, contact *Jim Toler WM8T, 3070 Van Tyle, Gaylord MI 49735. (517) 732-7748.* For further info: *Chain of Clubs, PO Box 4073, Gaylord MI 49735.*

SEP 22

Between POLK & FRANKLIN, PA The Ft. Venango Mike & Key Club's Ham Auction will be held at the Venango County 4-H Fairgrounds (Route 62) beginning at 9 AM. Free parking. Registration of auction items at 8 AM. Auction begins at 10 AM. Admission $2. $1 for pre-registered sellers. Contact *Jim Clinefelter N3BAT, (814) 437-1781* or *Bruno Wolozyn K3MHB, (814) 677-8894.* Or write the club at: *Ft Venango Mike & Key Club, R.D. #1, PO Box 591, Cranberry PA 16319.*

BERLIN, VT The Central Vermont ARC will hold its second annual Fall Foliage Hamfest/Fleamarket at the National Guard Armory from 9 AM-3 PM. VE Exams at 1 PM, walk-ins welcome. Handicapped accessible. Admission $2. Tailgating $4. Tables (provided) $6 advance, $8 at the door. Talk-in: 146.625. Contact *Todd Bigelow, PO Box 524, Williamstown VT 05679. (802) 433-5587.*

SEP 22-23

MOBILE, AL The MARC Hamfest/Computer Show will be held at Abba Temple Fair Grounds from 9AM-5 PM Sat., and 9 AM-4 PM Sun. Self contained RVs welcome. VEC Exams at 10 AM Sat. Talk-in: 22/82 and 34/94. Admission $3. XYLs and children free. Tables $8 for one day, $10 both days. Hospitality room at the Family Inn. Mail registrations to *MARC, PO Box 9315, Mobile AL 36691-0315.*

GRAYSLAKE, IL The Chicago FM Club will sponsor Radio Expo 90 at the Lake County Illinois Fairgrounds. VE Exams. Indoor Flea Market tables & electricity available. Overnite security. Camping. Admission: $4 advance, $5 at the door. Talk-in: 146.16/.76. Contact *Mike Brost WA9FTS, PO Box 1532, Evanston IL 60204.*

SEP 23

QUEENS, NY The Hall of Science ARC Hamfest will be held at the New York Hall of Science parking lot-Flushing Meadow Park, beginning at 9 AM. Set-up after 7:30 AM. VE Exams at 10:30 AM and 12:30 PM. Donation: Buyers $3, sellers $5 per space. Talk-in: 144.300 simplex link, 223.600 repeater, 445.225 repeater. Call (at night) *Steve Greenbaum WB2KDG, (718) 898-5599* or *Phil Kubert N2HYE, (212) 777-8648.*

DANBURY, CT The Candlewood ARA will sponsor a Flea Market at the Elk's Club from 8 AM-3 PM. Set-up at 7 AM. Admission $4, kids under 12 free. Tables $8. Tailgating $8 (includes 1 admission). Talk-in: 147/72-12. For info call *(203) 790-7987; (203) 775-6738; (203) 426-1652.* Send check payable to *C.A.R.A., c/o Bob Elton, 60 Padanaram Rd #18, Danbury CT 06810.*

SEP 29

HORSEHEADS, NY The Elmira ARA will hold the 15th annual Elmira International Hamfest/Computerfest at the Chemung County Fairgrounds from 6 AM-4 PM. Free parking. Camping hookup $8 (County requirement). Admission $3 advance, $4 at the door. Children 10 years or younger free. Talk-in: Rookies repeater 147.36/.96; 444.20. Tickets contact: *Dave Lewis, RD#1 Box 191, Van Etten NY 14889.* Dealers: *Jay (607) 733-0761.* VE Exams: *Bill, (607) 962-1134.*

SEP 30

BENSON, NC Johnston ARS will hold the second annual Jarsfest 1990 at the American Legion Complex. Advance admission $4, $5 at the door. Flea Market space and indoor tables. Contact: *Johnston ARS, Rt. 1 Box "JARS", Benson NC 27504*, or call *(919) 894-5479, 7 PM-9 PM.*

SPECIAL EVENT STATIONS

SEP 1-3

PARADISE, AZ The Cochise ARA will operate WA7KYT from Ghost Town, around the clock from Sat.-Mon. Frequencies: CW—7.040; Phone—3.885, 7.285, 14.288, 18.150, 21.288, 28.385, 6 M. For special certificate send 9 x 12 SASE to *Cochise ARA, PO Box 1855, Sierra Vista AZ 85636.*

WATERFORD, CT The Tri-City ARC will operate station KA1BB from Sat. at 1700Z-2300Z Mon. at the Waterford CT I-95 Weigh Station to promote safe Labor Day holiday auto travel. This event is in conjunction with the seventh annual Stay-Awake Coffee Stop offered by BSA Troop 24 of Niantic CT. Frequencies: The middle of the 80, 40, 20 and 15 M General Class phone and CW bands. Talk-in to Coffee Stop on FM 146.52 direct and CB channel 19. QSL with letter size SASE via *Tri-City ARC, PO Box 686, Groton CT 06340.*

SEP 1-9

ROLLING MEADOWS, IL Operators from the Rolling Meadows ARC and its sister city, Henin-Beaumont, will celebrate the 35th anniversary of the Founding of Rolling Meadows. Frequencies: Phone—up 15 kHz in General bands; CW—up 45 kHz from bottom of band. Novice activity is also planned for both modes. Stations will use personal calls. Phone stations will announce, and CW stations will identify with "RMI" tag. 10 through 80 meters. QSL with SASE to *Bob Lynn W9PYA, 3802 Jay Lane, Rolling Meadows IL 60008.*

SEP 3-8

ATLANTIC CITY, NJ Southern Counties ARA will operate K2BR from the Miss America Pageant from 9 AM EST. Phone: 25 kHz

inside lower General Class bandedge CW 65 kHz inside lower General Class bandedge Novice 28.100-28.500 MHz QSL SASE #10 via *SCARA, PO Box 121, Linwood NJ 08221*

DAVENPORT, IA The Palmer College of Chiropractic ARC, in cooperation with the Davenport RAC, will sponsor a Special Events Day, commemorating Chiropractic Founders Day at Palmer College, and the original site of broadcast station WOC, which was Ham Radio—9BY in the early 1900s, prior to obtaining the present call letters of WOC. Operation will be from 1300Z to 0100Z. Frequencies: 10 kc up from the bottom of General portions of each band. For certificate send OSL and a No. 10 SASE, for QSL card send std SASE to *Dr. Wayne Henry Zemelka KB0CIO, 1000 Brady St., Davenport IA 52803.*

SEP 22-23

BUTLER, PA The Butler County ARA will operate W3UDX from approximately 1300Z-0400Z on Sat and from 1600Z-0000Z Sun., to commemorate the 50th anniversary of the First General Purpose vehicle (Jeep). Frequencies lower portion of 80, 40, 20 and 15 M General phone bands and Novice 10 M phone and CW. Also on 147.96/.36 and 146.52. For unfolded certificate send QSL and 9 x 12 SASE to *Butler County ARA, Box 1787, Butler PA 16003*

SEP 28-30

PEA PATCH ISLAND Historical Ft. Delaware DXpedition on Pea Patch Island (I.O.T.A. # Pending). The Tristate IARC will hold a weekend DXpedition outing courtesy of the Delaware State Park Commission. SSB operation on the General portion of 40, 20, 15 and Novice 10 M. Also, 2 and 6 M. Operators will be KA3PVT, KA3PFH, N3EMY, KA2RRK and W2BN. OSL direct to the appropriate operator by SASE.

BRANCHVILLE, SC The Edisto ARS will operate AD4U from 10:00-22:00 EDST Sat and 13:00-18:00 EDST Sun. Frequencies 28.400, 14.285, and 21.375 (±). Send OSL and SASE for impressive 8½ x 11 certificate to: *AD4U, PO Box 117, Branchville SC 29432-0117*

SEP 30

KINGWOOD, WV Preston County amateur radio operators will operate WM8E from 1400Z Sept 28-0200Z Sept. 30, in celebration of the 49th annual Preston County Buckwheat Festival. Operation modes will be phone or CW on 40, 20, 15 and 10 M. Contact may be made approximately 25 kHz up from the bottom of General phone bands or Novice CW bands. For certificate, send QSL and SASE to *John Wills KE8NO, 104 Swartz Rd., Kingwood WV 26537.*

SEP 30-OCT 1

SANDIA PARK, NM Fall Classic and Homebrew Radio Exchange, will be sponsored by the Classic Radio Newsletter, from 2000Z-0400Z. Our object is to restore, operate and enjoy homebrew equipment and equipment at least 10 years old (not required for entry). The same station may be worked multiple times with different equipment on each band/mode. Frequencies—Phone: 3880, 7290, 14280, 21380, 28320, CW—60 kHz up from lower bandedge. Novice/Tech—3720, 21120, 28320 (Most of the action is on 7060 and 3560.) Add number of all transmitters and receivers worked plus the different states/provicences/countries worked per band/mode. Multiply by total age of all your transmitters and receivers used (minimum three QSOs per unit). For transceivers, multiply age by 2. For homebrew, count as 25 years unless older. Sporadic awards. Mail logs, comments, plus SASE for Newsletter to *Jim Hanlon W8KGI, PO Box 581, Sandia Park NM 87047.*

Number 26 on your Feedback card

UPDATES

T.D. Systems' Address

The correct address for T.D. Systems is 2420 Superior Drive, Suite B, Pantego TX 76013. The street number, 242C Superior Drive, as given on page 49 of the August 1990 issue, is incorrect.

C-64 & 1541 Drive Conversion

Now a letter from John M. Franke WA4WDL of Yorktown, Virginia: "I enjoyed K6YDW's article, 'C-64 & 1541 Drive 12-Volt Conversion,' in the July 1990 issue. There is one small mistake that is not overly important but is repeated by many amateurs. Mr. Neeley uses a frequency counter having 'at least seven digits' to set the MM5369 oscillator to 3.579545 MHz. While that is the color burst frequency, the chip does a divide by 59,659, which would indicate that the oscillator should be trimmed to 3.759540 MHz.

"By the way, the instruction sheet for the Ramsey TB-6 also states that the correct frequency is 3.579540, not 3.579545 MHz. The output frequency if you use the wrong frequency is 60.000084 Hz. But if you are going to use a seven-digit counter, you might as well adjust the oscillator to the correct frequency."

New Kenwood Service Number

Kenwood has a new toll-free service number for amateurs requesting parts: (800) 637-0388. National Service Manager Joel Berger says that the new number "...is designed to make the purchase of parts as easy as possible for our customers."

The toll-free service will be available from 9 a.m. to 6:30 p.m. EST, Monday through Friday. FAX service is available at (516) 483-5904. Local customers should call the local number.

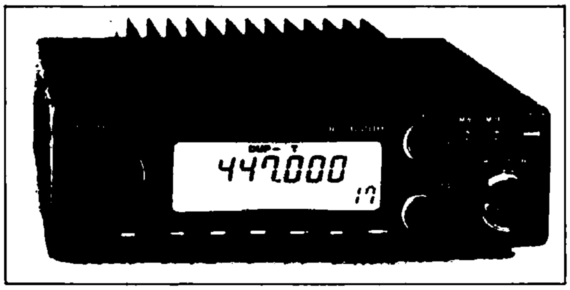
Variac Danger

In the June 1990 "Ask Kaboom," it's stated that a variac can be used in lieu of an isolation transformer. A variac is an autotransformer and does NOT provide any isolation or protection to the operator. The danger of shock is not eliminated with a variac. *Thanks to Ted Heuer WA2RGB of Rosedale, New York, for this information.*

Number 27 on your Feedback card

NEW PRODUCTS

Compiled by Hope Currier



PRODUCT OF THE MONTH

ICOM

The new IC-3220A/H from ICOM is a small dual-band FM mobile transceiver. The IC-3220H offers 45 watts output on 144 MHz and 35 watts on 440 MHz; the IC-3220A gives 25 watts on both bands. These compact transceivers measure 5.5" x 1.6" x 7.7". Illuminated controls give you complete operating versatility at night. There are 36 memory channels (18 for each band), two call channels and two scan edge channels. The HM-56 hand microphone is an added bonus, with 14 DTMF memory channels convenient for autopatching. In addition to full duplex telephone-style QSOs, these transceivers receive both main and subband signals simultaneously. A built-in duplexer provides easy dual-band antenna connection.

The suggested retail price for the IC-3220A is $660; $700 for the IC-3220H. Contact *ICOM America, Inc., 2380 116th Ave. N.E., P.O. Box C-90029, Bellevue WA 98009-9029. Phone: (206) 454-8155 or (800) 999-9877.* Or circle Reader Service No. 201.

MFJ

MFJ has released a new 440 MHz antenna tuner, the MFJ-924, with a built-in SWR/wattmeter. The MFJ-924 handles power up to 200 watts. Its compact size (8" x 2½" x 3") and wide impedance matching range make it an excellent choice for mobile and/or base operation. It also features SO-239 input and output connectors and a wing nut post for ground. The SWR/wattmeter shows power on 30 or 300 watt scales and SWR.

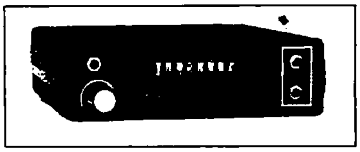
The MFJ-924 is priced at $70. Contact *MFJ Enterprises, Inc., P.O. Box 494, Mississippi State MS 39762. Phone: (601) 323-5869; FAX (601) 323-6551; Telex 53 4598 MFJSTKV.* Or circle Reader Service No. 202.

VIS STUDY CARDS

VIS Study Cards tor Amateur Radio provide a simple way to study for the written tests at all levels, Novice through Extra. This system provides a complete set of flash cards for each examination element. Each question, along with its correct answer, appears on one side of a card, with the key words in both the question and the answer underlined. The reverse side contains the question and all four multiple choice answers from the VEC question pool (to be used during the learning process as a self-test). This study system helps the ham-to-be or upgrade candidate overcome the fear of tests and gain confidence and knowledge quickly and easily, and without using a computer!

For prices and more information contact *VIS Study Cards, P.O. Box 16646, Hattiesburg MS 39402. (601) 261-2601.* Or circle Reader Service No. 207.

SOMERSET ELECTRONICS



The MICRODEC™ multimode decoder from Somerset Electronics decodes Morse Code, Radioteletype (all standard shifts) and ASCII. It comes with these standard features: an intelligent, 8-segment LED dot matrix display with intensity controls; an ASCII serial computer/printer interface; an internal code practice oscillator; an internal speaker with volume control; and simplified push-button operation. It operates on DC voltages from 9 VDC to 15 VDC. It can be powered by a car, boat or any type of negative ground DC power source.

The standard display color is high-efficiency green, with red and yellow displays available as optional features. Display intensity controls provide exceptional readability and clarity under various light conditions. A 120 VAC/12 VDC power adaptor is standard. There is also an optional battery pack/charging circuit.

The list price for the standard unit is $230, with an introductory sale price of $200, plus $8.50 for domestic ground shipping and handling. Contact *Somerset Electronics, Inc., 1290 Highway A1A, Satellite Beach FL 32937. (407) 773-8097.* Or circle Reader Service No. 205.

SPI-RO

Spi-Ro Manufacturing, Inc. is now offering a high performance 2 meter base station antenna that has 4.5 dB gain with an omnidirectional pattern. This 4.5 dB gain feature more than doubles the transmitter output power (effective radiating power) and the receiver sensitivity.

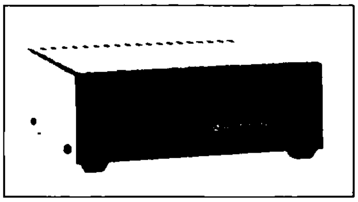
The VHF-45 covers 144-174 MHz and needs no ground plane or radials. Its heavy-duty construction, with 6061-T6 seamless aluminum and all-stainless-steel hardware, provides years of maintenance-free service. The VHF-45 will handle 250 watts. It has 50 ohm impedance and is DC grounded for lightning protection.

The VHF-45 is priced at $90 and is available from *Spi-Ro Manufacturing, Inc., P.O. Box 5500, Dept. 105, Lakeland FL 33807. (813) 646-7925.* Or circle Reader Service No. 204.

CONTACT EAST

The new supplement to the Contact East General Catalog is a reference guide for engineers, managers and technicians. It offers a wide range of reliable brand-name products for testing, repairing and assembling electronic equipment. This update includes many new products: linear power supplies, analog/digital oscilloscopes, inspection products, soldering/desoldering equipment, temperature/humidity chart recorders, static protection products, and many other items. All products are described in detail with specifications, full color photos, and discounted pricing.

This supplement is free from *Contact East, 335 Willow Street, North Andover MA 01845. (508) 682-9844.* Or circle Reader Service No. 206.



ASTRON

Astron Corporation has introduced a low profile power supply, model SL-11A. The SL-11A has been specifically designed as a base station power supply for two-way radios. It is very well regulated and will provide 11 amps of current at 50% duty cycle. The power supply has foldback current limiting to protect the power supply from overload and short circuits. It also has an overvoltage protection feature in case the voltage exceeds a safe level. The SL-11A is available in black or gray.

Contact an Astron dealer for the price. *Astron Corporation, 9 Autry, Irvine CA 92718. (714) 458-7277.* Or circle Reader Service No. 203.

Number 36 on your Feedback card

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Baltimore MD 21208

ROBOT Research Still Alive

Sometimes this column works almost too well! A few months ago, I published the plea of Robert Dick K6YON who worried about the long-term health of his ROBOT 800 RTTY unit. Now, just as that request is being published, along comes the answer and, as Bob tells it, you'll never believe the source.

It seems that Bob mentioned to his wife that it was too bad that the ROBOT people had gone out of business. Bob says that "being a typical XYL *[?—Eds.]*, she picked up the telephone, asked information for the ROBOT phone number in San Diego . . . and got it!" ROBOT Research is still very much in business. While they no longer manufacture the ROBOT 800, nor any RTTY units, they assured Bob that they continue to service and repair them.

Readers who may need the information should contact ROBOT Research, 5636 Ruffin Road, San Diego CA 92123. Their telephone number is (619) 279-9430. Be sure to get in touch with them BEFORE you send them any equipment. Request a Return Authorization (RA) number for your equipment, and then relax.

An active RTTYer, Bob also passes along the information (accomplishment!) that he has worked Luxembourg, Italy, Germany, England, France, Sweden, Japan, and the USSR with 5 watts on 10 and 20 meter RTTY! Must have one hell of an antenna, Bob!

ASR-35, CoCo WEFAX, Tandys III & 4, Heath and HAL

This month's illustration of RTTY commitment comes from Ron Johnson WA5RON of Austin, Texas. Ron describes his setup as a classic Teletype Corporation ASR-35 in a current loop to a Lenkurt commercial TU. He built a remote transceiver control into the accessory panel, with a speaker, volume control, and transmit lock button, so that he can run the rig over a four-wire phone line. He does most of his communicating on 2 meter FM. As you can see, the teleprinter hardly ever needs service. Don't you just love action shots?

Now that we've solved a problem and had some fun, let's look at another ham's concern. Lisle T. Hines K2QLA of Homer, New York, relates buying a NOAA receiver. It works well enough for him to copy near overhead passes with no noise for at least 15 minutes on each pass. The receiver, from Hamtronics, is on 137.62 MHz, and it has a 30 kHz bandwidth.

His problem is that the CoCo WEFAX program will not copy a picture, but it will copy the picture borders. The signal seems to hang up at the 2300 Hz end of the scale. He wonders if the FM signal, modulated by AM, is just too much to ask the computer to copy. Lisle has no problem using the WEFAX program on HF and the like, copying hurricane pictures, but he would really like to try to make a go of it on the satellite. Any help from any of you would be appreciated. I'll print what I find out here.

Going from high tech to low, my regards to Domenic Mallozzi N1DM of Watertown, Massachusetts, who passes along the description of his station. Dom is running an old Model 15 page printer with a HAL ST-5 terminal unit and a home-brew AFSK. A Heath HW-101, from the vintage years of Heathkit, handles the RF end of the station, which is physically located in Rhode Island. I am sure the pile-ups multiply when N1DM hits the bands. Thanks for the info, Dom, and hope to see you on the air.

With old teleprinters often come old computers, and Tom Bright W2OHI of Bergenfield, New Jersey, has a few of them. Tom was using Tandy Model III and Model 4 computers in his office, and he has converted the office over to PC systems, freeing up the older computers for ham use. He wonders if anyone is still using these on the ham bands.

Communications Software

If you use any of the latest and greatest smart terminal units, a simple communications package may be enough to get either of these systems onto RTTY. While there were some packages available years ago for running RTTY with these computers, I don't believe any of them are still marketed. Of course, as always, your input is welcome.

Now for a look at some of the latest. Let's turn to good old MFJ Enterprises, Inc. A few months ago, I discussed their MFJ-1292 video digitizer, which enables you to use a video source as an input device for digitized pictures. Now they have come up with the MFJ-1289 MultiCom™ software for their MFJ-1278 Multi-Mode controller. This PC compatible software allows the transmission and reception of multi-gray level weather maps, wire photos, and SSTV pictures.

Other features of this program which enhance the controller include single key macros, quick setup of command parameters, an integral word processor, and even an alarm that lets you know when a specified call or sequence shows up. It's all wrapped up in a menu which allows access to external picture files, text files, and the like. Supplied on either 5¼" or 3½" inch disks, this copy-protected (Yechh . . . why?) software can be installed on a hard drive.

For more details, contact MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762. Or call them at (601) 323-5869. Do I have to remind you to drop "RTTY Loop's" name when you call?

Time to Tighten Up

I kind of omitted my usual monthly introduction at the top of this month's column, as I wanted to get right into the information on ROBOT Research. But as we look towards autumn, I want to say that this is an ideal time of year to go through the shack tidying up loose ends and tightening up all the outside connections for winter. And as you do all that, keep us in mind. Send along that idea, tip, question, or trick so that we can share the wealth with the multitude. Reach me, as always, by mail, at the above address, or via CompuServe (ppn 75036,2501) or Delphi (username MARCWA3AJR). And read about it right here, in next month's "RTTY Loop." 73

Ron Johnson at work on his RTTY station.

Number 28 on your Feedback card

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
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Houston TX 77083

RS Chasing—Any Time, Any Place

On a recent trip out of town I heard RS-10 telemetry and transponder activity on a simple mag-mount 10 meter antenna with my mobile HF transceiver. Signals were quite good. Out of curiosity, I hooked up a 2 meter rig to another mag-mount and tried to access the ROBOT autotransponder. I could hear my signals getting through the satellite, with only 2 watts, to the simple quarter-wave mag-mount. Heather WB5RMA was not impressed since we were supposed to be touring the state capitol in Austin and I was more excited about CW from space.

Using the push-to-talk switch as a code key, I tried for a contact with the ROBOT. The ROBOT could hear the signals *but couldn't understand the imperfect* hand-sent CW. Signals were also good through the transponder during overhead passes, but the system was not easy to use.

However, here were most of the components for a good portable RS-10 Earth station. I had discovered that a simple receiver, handie-talkie and mag-mount antennas are all that's needed to make marginal contacts via satellite. For higher quality QSOs, some changes were necessary.

The primary transponder on RS-10 has a 2 meter uplink passband from 145.860 MHz to 145.900 MHz. The downlink can be heard from 29.360 MHz to 29.400 MHz. The telemetry beacon sends CW on 29.357 MHz and the ROBOT downlink is on 29.402 MHz. Signals are quite loud on most 10 meter rigs, even with simple antennas.

Since the days of AMSAT-OSCAR 7 and 8, I have configured several systems for mobile and portable work via satellite. This time I wanted a system that could be inconspicuously taken anywhere (a good idea in capitol rotundas), set up in a hurry and still make good quality contacts.

The experiment in Austin proved that for consistent operation, more power and better antennas would be needed on the uplink. The receive antenna was adequate but a preamp would have helped. And, since a complete station consists of several components, I needed something that would keep everything together and still be portable.

The Portable Solution

I gave an old briefcase new life, using it as the station, with a Uniden HR-2510 mounted on an aluminum plate that just fit in the case. A Santec LS-202A HT and a small home-brew amplifier filled out the space with just enough room for a small terminal strip, some Radio Shack snap-together toroid choke cores and a Janeil 10 meter preamp. A code key was friction-fit on top of the HT between the Uniden and the 2 meter amplifier. A speaker/microphone was included for voice activity. From the terminal strip, a power cable was attached with a standard cigarette lighter plug for mobile operation. Initial tests without the toroid chokes caused excessive desense in the 10 meter rig when using the amplifier and transmitting on 2 meters. Power output was near 25 to 30 watts. Instead of the simple quarter-wave whip used on 2 meters during the Austin experiment, I incorporated a Larsen ⅝-wave whip and got better results. The mobile Earth station was now complete.

Stationary activity from hotel rooms, campsites or roadside parks allows the use of a more effective 10 meter antenna. I rolled up a simple dipole with feedline attached and placed it in one of the briefcase pockets and used fishing line to hang the dipole from available structures. I also included another power cord with clips for connecting to a large gel cell or motorcycle battery when available.

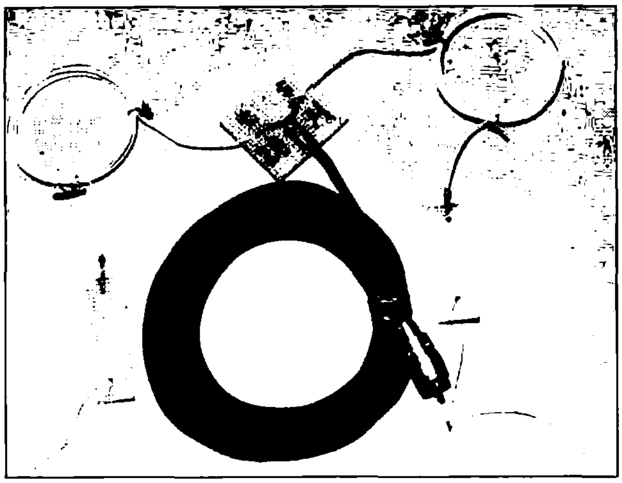

Photo B. A simple dipole works well for a portable "RS" station, and it is easy to install or store.

Configuring Your Own System

My Earth station in a briefcase used equipment I had on hand. The amplifier was originally for FM operation, but I used a few resistors and diodes to "linearize" it. The power transistors were biased slightly on, to respond properly to the SSB excitation. For CW work, this wouldn't have been necessary.

Some FM rigs have excessive chirp, but try a normal FM 2 meter rig for CW uplinking. If yours works, use it. Any power level from 25 to 50 watts output will do very well when used in conjunction with a ⅝-wave whip. Ten watt rigs will work but they will not provide consistent signals on low-horizon passes. Multimode rigs are best. They have the advantage of SSB for voice operation. A Kenwood TR-751A or a Yaesu FT290R-II will do extremely well.

For the 10 meter downlink, the Uniden HR-2510 or 2600 will provide satisfactory results even though there is only adequate selectivity on these units. Sensitivity is good since the radios are designed for 10 meter operation. Unlike the crowded conditions on the low end of 10 meters, activity is spaced more evenly in the RS-10 downlink. The only problem is the loud signals from FM stations making terrestrial contacts without regard to the satellite subband. Experiments with home-brew 10 meter direct-conversion receivers would be interesting, since only a small portion of 10 meters need be received.

A preamp is not always necessary, but it can help when the satellite output is down or you are using a very small receiving antenna. Advanced Receiver Research and Hamtronics have some inexpensive *preamps*. Building *one* from *The ARRL Handbook* is another alternative.

Photo C. Mike WA5TWT checks an "RS" pass using the portable station while on a fishing trip to central Texas.

Almost anything will work for transmit antennas. During mobile operation the ⅝-wave mag-mount is preferred, but a collinear or quarter-wave whip will also do. On the downlink, a modified CB mag-mount is an excellent choice. Usually the only alteration necessary is to remove one or two turns of the upper coil in the antenna base to change the antenna's resonance from 11 meters to the upper portion of 10 meters. Another good downlink antenna is the quarter-wave whip. A 102" CB antenna can be cut back a few inches very quickly. Commercial ham anten-

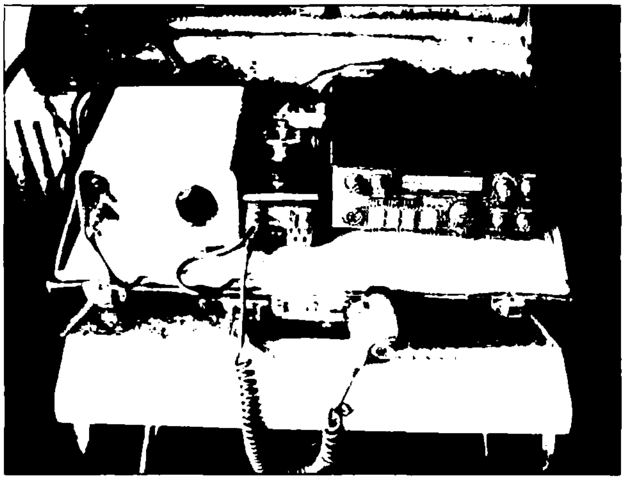

Photo A. A complete "RS" station in a briefcase—just add power and antennas.

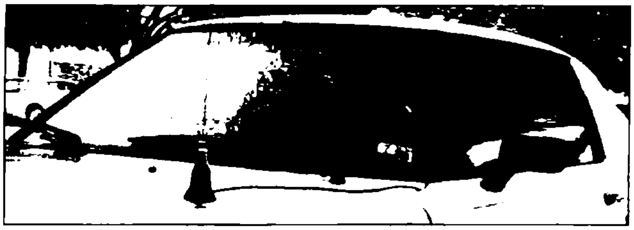

Photo D. For mobile "RS" work, a modified "CB" mag-mount placed away from the 2 meter uplink antenna does an excellent job.

nas, like the Hustler, would function equally well.

The uplink and downlink antennas for satellite work should be separated as much as possible to keep the transmitter from interfering with reception since operation is full duplex. You listen to your own signal as it is being retransmitted by the satellite. It may be necessary to locate the feedlines through different windows on a car, placing the antennas at opposite ends of the vehicle. Note that it is never a good idea to attempt satellite contacts while in motion, unless someone else is doing the driving.

The power to the radios may also need separation. The ferrite cores wrapped around the power lines to the transmitter and receiver are not always completely effective. One radio can be connected through the cigarette lighter while the other can be hooked directly to the battery. Radios that run from internal batteries may also help eliminate any desense problems. Once again, experiment to find the best configuration.

For more ideas on mobile satellite work, check the "Hamsats" column in the October 1987 issue of *73*. Further details on portable operation can be found in "Black Bag Portable," by Tom N6DGK, in the July 1989 issue of *73*. "Poor Boy Satellite Station," by Allan N5LKJ, in the December 1989 *73* supplies further data on simple-to-use and easy-to-construct satellite stations.

Microsats and DSP

DSP, or digital signal processing, has been around for many years but is now becoming more commonplace in amateur radio equipment, thanks to dedicated chips designed specifically for this purpose. The Advanced Electronic Applications DSP-1232 and DSP-2232 multimode data controllers are some of the first stand-alone units to become available to the ham radio market. Both are scheduled for release in September or October of this year.

The DSP-1232 provides two switchable ports while the DSP-2232 has two simultaneous ports. Anticipated prices are $700 to $900, respectively.

DSP translates an analog input into a digital form. It then provides digital filtering and processing based on software control. The result is that modems are not built from hardware components but instead are written as software programs that are executed by a generic DSP unit. For the AEA devices, a Motorola 56001 chip provides the heart of the system. The units will be able to generate and receive any mode that can be programmed, including RTTY, FAX, SSTV and all packet formats. For the Microsat and Fuji-OSCAR 20 chaser, the units promise to allow PSK downlink with Manchester-encoded AFSK uplinking. They will also provide operation via the 9600 baud UoSAT-OSCAR-14 digital communications experiment.

Like the first calculators or the early digital watches, DSP units are expensive. On the positive side, as more communications modes are devised, appropriate software for the units will likely be produced. AEA expects to have ROM upgrades available for about $30 when new software is written.

After a satellite pass is over, the box can do other chores since it is not tied to just one mode. The use of DSP in amateur gear promises to provide exciting possibilities for future ham activity. Other manufacturers (DRSI and L.L. Grace Communications Products, Inc.) are working on stand-alone DSP boxes and DSP plug-in boards for PC-compatible computers. They will be mentioned in future columns as the information becomes available.

For more information on the DSP-1232 and DP-2232, contact *Advanced Electronic Applications, P. O. Box 2160, Lynnwood WA 98036, (206) 775-7373.*

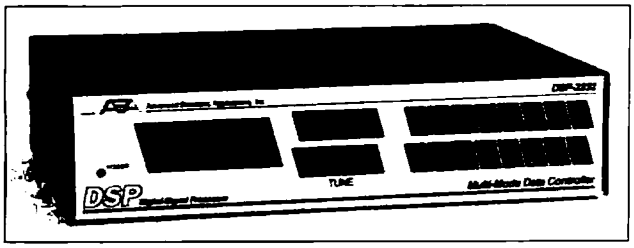

Photo E. The new AEA DSP-2232 promises to be a great addition to stations operating via the Microsats.

Number 29 on your Feedback card

HOMING IN

Radio Direction Finding

Joe Moell, PE, KØOV
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Quads with Class

For sensitivity, simplicity, and low cost, you can't beat a quad antenna for radio direction finding (RDF) on 144 MHz and up. Home-brew quads give excellent performance but they take some time and effort to build and, let's face it, sometimes their "primitive" look is not particularly pleasing on a car.

Before a fledgling hunter can assemble his new pride and joy, he has to scrounge all the parts, measure and cut everything to size, drill all the various holes, and figure out how to connect the coax at the feed point. I'm sure more hams would be out on VHF T-hunts if they knew how to avoid these quad-building chores, and could be assured of a good-looking end product.

I have searched for a long time for inexpensive commercial VHF/UHF quad kits that are suitable for mobile T-hunting and look good. Until now, all the designs have been either too flimsy for mobile use or much too expensive. (Would you believe $125 for 4 elements on 2 meters from one manufacturer?)

A Classy Answer

Bill Levey WA4FAT, who heads up Amateur Applied Electronics (AAE) of Birmingham, Alabama, is an avid T-hunter. Thus, it was natural that his company, which makes the classy-looking Bandmaster line of quads for VHF DXers, also develop antennas that can be used for RDF. AAE is encouraging the growth of foxhunting by selling a simple 2-element quad for only $30. You may not find it in the AAE ads, but it's "on the shelf": the "T-Hunt System," Model Q-144-2 (see Photo A).

These 2-element quads are popular for foxhunting in Birmingham because they are more sensitive than Dopplers, and they fit into the back end of a passenger car before and after the hunt, without disassembly. WA4FAT encouraged me to try one on some Southern California T-hunts.

AAE took care to select high quality materials. These quads will take punishment, whether on a high-speed mobile or on a house in an inhospitable climate. The boom is 1"-square exterior grade Fiberglas™, ⅛" thick. Spreaders are ¼"-round Fiberglas, tapered to a point at the ends to mate with the special plastic forks that hold the elements firmly in place (see Photo B).

Elements are #14 AWG type THHN stranded wire, with ultraviolet-resistant insulation. The loops are spliced with end connectors and covered with heat-shrink tubing. Hitch pins hold the spreaders in place on the boom.

The T-Hunt System is a very light antenna (it weighs less than a pound) but the Fiberglas construction makes it very rugged. Yet, I suspect that in an encounter with a particularly vicious tree, an element might come off completely and remain snagged on a high limb! Fortunately, the T-Hunt System, like the other antennas in the Bandmaster line, carries a one-year full-replacement warranty.

You don't need tools to put the quad together. The AAE ads claim that it can be assembled in 10 minutes or less. I did it in nine-and-a-half minutes the first time; now I can do it in half this time. One minor annoyance is that the little plastic forks are not secured to the rod tips. They can get lost if you take the antenna apart frequently. AAE supplies a few extra forks and hitch pins, figuring that you'll lose some.

Head for the Hill

The first stop on my evaluation tour with the Q-144-2 was a local hilltop which gave an unobstructed view to several local and distant repeaters. With no nearby reflecting objects, I got a good idea of the quality of the pattern and compared it to my regular 4-element hunting quad using a precision RF attenuator.

A 2-element quad is not a "super sharp" antenna. If you plotted it on polar paper, the azimuth pattern would be shaped more like a heart (cardioid) than a cigar or torpedo. The 3 dB beamwidth with vertical polarization turned out to be 101 degrees. In practical terms, this means that turning the antenna 50 degrees to the left or right of the peak makes the S-meter go down only about one-tenth scale.

Response with this antenna turned at right angles to the signal source (±90 degrees) was only 9 dB down, going to 21 dB down at ±135 degrees. By comparison, my home-brew 4-element quad has a 3 dB beamwidth of 62 dB, and is down 17 dB at −90 degrees. The 4-element quad also had 2 dB more gain than the Q-144-2, as expected.

The front-to-back ratio of the Q-144-2 is specified as greater than 24 dB. I found that the rear null was very sharp and much deeper. Depending on feedline routing, the null was 30 to 40 dB down. No doubt you could use the null to help get bearings in some situations.

Feedline routing makes little difference to the pattern but it greatly affects drive impedance. AAE recommends routing similar to Photo A, which gives feed point impedance of 100 ohms. The 13¼" length of RG-59 shown matches the quad to RG-58 feedlines. I achieved excellent transmitting SWR this way using a nonmetallic (PVC pipe) mast.

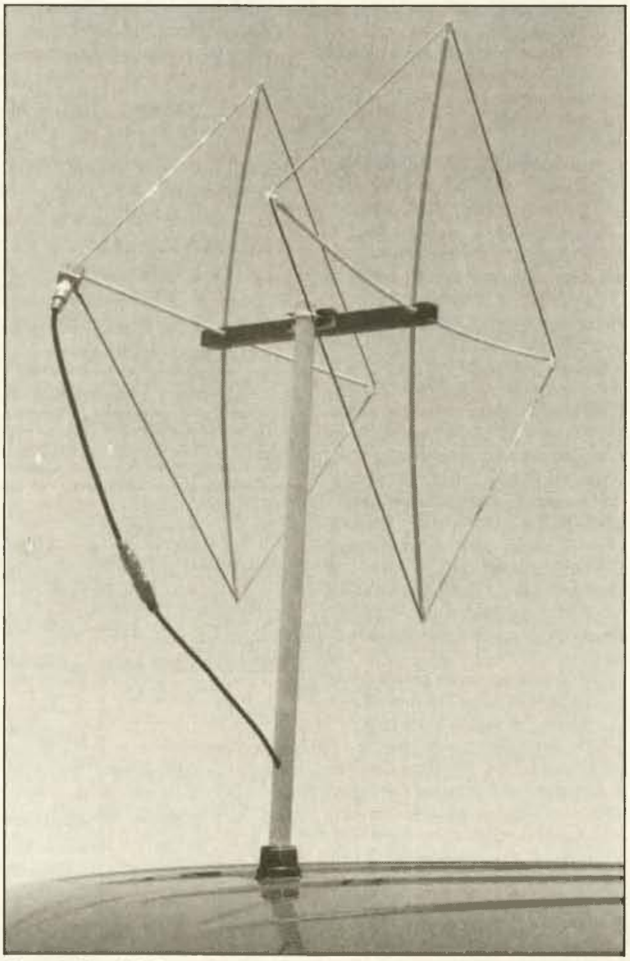

Photo A. The AAE Q-144-2 is installed on a PVC mount, ready for hunting. The quarter-wavelength matching line and coax routing give optimum transmitting SWR.

For receiving only, I found I could run RG-58 from the feed point to the top of the mast, then down the inside (no RG-59 matching line) with no degradation in RDF performance.

On many hunts, you must select horizontal or vertical polarization to match the polarization used by the hider. The fastest way to change polarization on the AAE VHF quads is to pop the driven element off the spreaders, rotate it 90 degrees, and pop it back on again.

I have needed to check polarization many times on some hunts, so I wish there were a faster way. For its foxhunting antennas, I recommend that AAE go to a circular boom with a slip joint at the mast junction so the entire boom can be rotated to quickly change polarization. This would give the added advantage of allowing "in-between" polarizations, such as 45 and 135 degrees, which help on some hunts and can't be achieved with the Q-144-2 as is.

The Acid Test

My first competitive test of the Q-144-2 was on the monthly "Pathfinder" hunt. (It gets its name from Pathfinder Road, which runs past the starting point in Diamond Bar, California.) This nighttime outing has boundaries that permit the hidden T to be over forty air miles away in some directions.

All of the ten other teams at the starting point were using quads or yagis with 3, 4, or 5 elements. WA6OPS and I had no trouble detecting the weak, vertically polarized hidden-T signal, but we were using an inline GaAsFET preamp. Several other teams could not hear the hiders (KB6MAH and KB6NYW) so they raised transmit power a bit.

The initial bearing was 57 degrees, straight toward Crestline in the San Bernardino mountains. Whenever this happens on a hunt from Los Angeles or Orange counties the hiders are alert to the likelihood of a "Baldy bounce,"

continued on p. 73

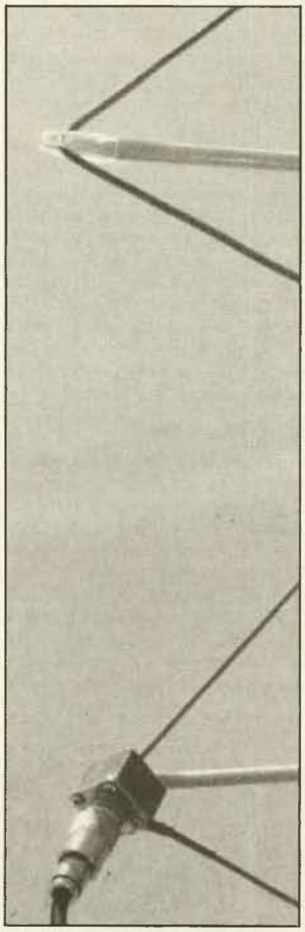

Photo B. This close-up of the Fiberglas rod tips shows one of the plastic forks that hold the elements in place, and the weatherproof coax connection for the driven element.

Number 30 on your Feedback card

ABOVE AND BEYOND

VHF and Above Operation

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Brick Oscillators and Crystal Multipliers

Some of you have sent in comments and questions about microwave brick oscillators (see the December 1989 issue) and microwave oscillator multiplier strings. You want to know which type of oscillator, the commercial brick or the crystal multiplier, is better. Now, I am a poor person to ask because I am about equally biased in both directions. I like to build; no, actually, I probably go out of my way to build just about anything that perks my interest. However, we don't have an infinite amount of time to build everything we'd like, so we must take shortcuts whenever possible.

The answer really depends on your needs and how involved you want to get in a project. Some of you may want to put off construction until you have all the components, while others may begin as soon as they locate a key component at a flea market. The deciding factor will probably depend on which component you find first. Availability, cost, ease of use, reliability, and stability all enter into the picture.

As to availability for amateur use, the crystal oscillator rates number one since it's home-constructed. The only difficulty is that if you want an exact injection frequency, you have to order the crystal. This is true whether you make your own multiplier chain or use a brick. If you can tolerate operation on some obscure or fortuitous frequency such as you'd get with a junk box crystal, so much the better. However, most operators want an even MHz frequency for local oscillator injection so an exact fractional value crystal is a must.

Location of a surplus brick oscillator makes the project a lot easier from the standpoint of construction and reliability. It's a matter of what you desire in a circuit and what you are willing to spend to accomplish that goal. If I can find a brick in the frequency range needed I will use it. For example, in a 10 GHz system (10,368 MHz) the L.O. is 10,223 MHz (2 meter IF), and the crystal required is 100.2254902 MHz. A multiplication factor of 102 is used with a brick oscillator. It's not too likely you'll find this exact frequency crystal in your junk box. An exception to this would be a more commonly available 108 MHz crystal; times 12 gives you 1296 MHz and times 96 puts you on 10368 MHz. This is great for a band edge marker but not useful when you figure in the IF frequency.

Whatever frequency you use, it should be temperature controlled.

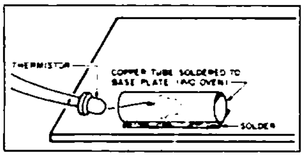

Figure 1. The thermistor inserted in copper or brass tube with heat-sink grease for best thermal contact.

That's the subject of this month's column: temperature control and the microwave circuit. I plan to build on this circuit and in the next few months go into the crystal oscillator multiplier system, winding up putting a 5.6 GHz system together.

Temperature Control Circuit

The crystal normally used in multiplier oscillator circuits is not temperature controlled, and as such it will change frequency with a change in temperature. The crystal can be set to an exact frequency, but it will wander as soon as a change in temperature affects it.

One problem is that when you use a surplus crystal, you can't be sure whether it's an oven type or not. To prevent temperature changes from affecting the crystal frequency, non-oven crystals are healed slightly above the ambient or outside temperature, while oven crystals are heated to a higher temperature.

The circuit used for temperature control is self-adjusting for any desired temperature. Select a bridge resistor equal to the thermistor equivalent resistance at the temperature needed. Oven type crystals normally are heated up to about 65 or 70 degrees Celsius (150 to 158 degrees Fahrenheit). Non-oven controlled crystals are heated to about 100 degrees Fahrenheit.

Calibration or verification of circuit operation is simple. You need two 10k thermistors. One is used in the control circuit and the other is used in the test circuit with an ohmmeter to verify that the circuit is working correctly. The 10k thermistor, similar to the electronic thermometer used in hospitals, is quite accurate, and it's readable to tenths of a degree with careful ohmmeter calibration. For our purpose a degree or two is not very important, but this simple setup will inform us about what is going on. All that is needed is a good thermal contact between the thermistor and the oscillator circuit, preferably the inner surface of a metal box housing the oscillator. See Figure 1 for thermistor positioning.

The temperature control circuit in these experiments was constructed from a single CA-3130 zero offset op amp. This useful device allows operation from just under ground potential to Vcc voltage swing. The temperature control circuit is a balanced bridge, one leg of which sets a reference DC voltage to pin 2. The other leg, comprising a fixed resistor and the thermistor, is the variable control arm of the circuit. The temperature is set by selecting a value for the reference resistor R1 to equal the thermistor resistance at the temperature desired. For example, at 50 degrees Celsius, the thermistor resistance should be 4.161 ohms. See the table for resistance vs. temperature calibrations.

Applying power to the circuit for the first time, the op amp turns on due to the reference voltage (pin 2) being higher than the thermistor control leg (pin 3). The thermistor at this time is at room temperature. The op amp and the TIP-120 transistor both turn on, and the heater coil begins to heat up due to current flowing through it. By the way, I wound my coil with Nichrome™ resistance wire, which requires far fewer turns than regular wire.

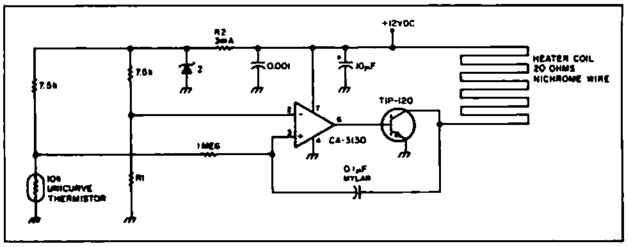

Figure 2. Temperature control circuit, positive 12 volts. Z_1 = Zener diode (1.5 to 5 V). R2 set for 3 mA current through zener regulator.

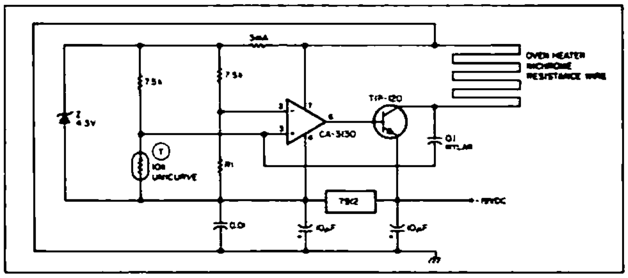

Figure 3. The temperature control circuit modified for negative 19 volt operation for compatibility with commercial brick type microwave oscillators.

As the coil heats up, the thermistor, which is in contact with the metal surface of the case, detects it. This heating causes the thermistor to decrease its internal resistance accordingly. This process continues until the thermistor resistance equals the R1 resistance, or the voltage on the bridge legs at both pins 2 and 3 are equal, which then turns off the op amp. As the circuit removes heat and the metal cools, the thermistor changes value. The op amp will turn on again, starting the cycle over.

Nichrome Wire

Kerry N6IZW designed this circuit. He has placed an unusual component in the feedback path, tying the output of the transistor to control pin 3 of the op amp. This capacitor and the 10 megohm resistor change the nature of the beast during initial turn-on, allowing the circuit to play "catch up." This helps bring the compartment up to temperature without large overshoot. When at temperature, the time constants of these components have little effect. See Figures 2 and 3.

The thermistor is available at Radio Shack, RS # 271-110, for $1.99 each. Nichrome wire is a little difficult to obtain, especially in small quantities. I purchased two rolls of the wire for this experiment and will make the wire available. Any wire can be used if the total resistance is the same. The wire that I have measures 2.34 and 7.479 ohms per foot. Nichrome wire can be ordered in various resistances per foot. It can have as little as 0.005 ohms per toot to 30 ohms per foot. The finer the wire, the higher the resistance.

Nichrome wire has another use. Shape a small piece of wire taunt between two nails, then run low voltage through it, heating it up to red hot. You can neatly cut clean slabs of styrofoam out of scrap packing material. The entire oscillator and heater circuit used as examples in the column were enclosed in such a container made with this "electric knife."

Next month I will get into the crystal oscillator portion of the temperature control circuit. The oscillator used in these experiments will operate from 90 to 108 MHz and can be used to control a brick type phase-locked oscillator, or serve as the beginning of a multiplier string. I have the circuit all prototyped out and working, and I should have a PC board designed by then that covers both the temperature controlled circuit and oscillator. By the way, the finished oscillator circuit is postage-stamp sized.

I used the oscillator I constructed as a reference feed for a 6 GHz brick oscillator. Normally these brick oscillators incorporate the oscillator internally, but lately surplus brick types require an external oscillator. At first I thought this was a bad deal. However, after close inspection I found them to be in brand new condition and very high performers. I am in the process of obtaining a quantity of the bricks and will make them available to those interested in them.

The Gunn Warmer

Recently I ran into the Gunn heater, a Gunn temperature control circuit made by Alan Rutz, SHF Microwave Supply, 7102 W. 500, S. La Porte IN 46350. Alan deals in Gunn oscillators and is making this kit to improve frequency stability. Alan maintains 120 degrees inside his Gunn enclosure even when the outside temperature is

Continued on page 77

Temperature vs. Resistance

Degrees (C.)	(F.)	Resistance
0	32	27.28k
10	50	17.96k
20	77	12.09k
30	95	8.313k
40	104	5.828k
50	122	4.161k
60	140	3.021k
70	158	2.229k
80	176	1.669k
90	194	1.266k
100	212	0.9735k

Resistance values for several temperature control points of reference. (Radio Shack thermistor)

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HOMING IN *continued from p. 68*

where the hiders are in some spot in western Riverside or San Bernardino County, shielded from the start point by the Santa Ana mountains. The signal reflects back to the starting point off the face of Mount Baldy or some other mountain in the San Gabriel or San Bernardino ranges.

If the hider is pulling off a Baldy bounce, following the initial bearing northeast toward the foothills is the worst thing to do because the best Baldy bounce hiding spots on the Pathfinder hunt are at least 25 miles to the southeast. We carefully checked toward the southeast for any direct signal leakage, but heard nothing.

As we left the start, we decided to play it safe by going east on a freeway through the Chino Hills. Then we could aim to the north or south to see if the initial bearing was direct or a bounce. The Q-144-2 is much lighter than our usual quad. It was very easy to spin it by hand, even at the speed limit on the freeway.

After driving about 20 miles through Pomona, Chino, and Ontario, and carefully looking both north and south, we concluded that the hiders really were near the northern mountains. The decision to go north instead of south at that point was agonizing, because the wide beamwidth of the two element quad left us unsure about the possibility of missing a weak signal source from the south in the presence of the strong northerly signal. Besides, signals from the north in that area had always been bounces in the past!

As luck would have it, Martin and Wayne really were hidden in the foothills at 2,200 feet elevation, very close to the northeast corner of the hunt boundaries. (Whew!) On the Pathfinder hunt, the lowest elapsed mileage wins. N6FBH won this one with about 34 miles.

Our mileage would have been very close to winning if we had not missed the correct freeway exit, forcing us to go an extra two miles into the mountain pass and then back again. (I suppose I could blame the quad's wide beamwidth for our missing the exit. Nah, nobody would buy that excuse.)

Most of the other teams figured out the no-Baldy-bounce ruse. But two went southeast on a hunch, figuring to out-fox the foxes. One team put 100 miles on the odometer before finding the T. The other group gave up after four hours of frustration.

The Bottom Line

The Q-144-2 is a great little T-hunt antenna, mechanically and electrically. It's rugged, easy-to-build, and it looks great. If you hunt mostly in the flatlands, and signals always have reasonable strength and one polarization, it may be all you will ever need.

But if you hunt in southern California or anywhere else where there are very weak signals, multipath or cunning signal bounces, you should get the AAE 4-element model (Q-144-4) instead. For a reasonable price (about $50), you get much narrower beamwidth and more gain, with the same fine mechanical design.

Of course, the 4-element version is heavier (less than 4 pounds) and longer (41 inches), so you will want to mount it in the center of the vehicle roof to avoid a ticket for excessive overhang.

If you hunt on 220 MHz or 440 MHz, AAE can supply quads for these bands, too. For more information on all the AAE antennas, write the company at 3164 Cahaba Heights Road, Birmingham AL 35243, or phone (205) 967-6122.

Number 34 on your Feedback card

73 INTERNATIONAL

edited by C.C.C.

Arnie Johnson N1BAC
103 Old Homestead Hwy
N. Swanzey, NH 03431

Notes from FN42

Time sure flies when you're having fun! This issue is my one-year anniversary writing the column. It sure doesn't seem like a year has gone by.

The job becomes easy when the 73 Hambassadors from around the world provide material that is timely and interesting. I just put it into some semblance of order and language. I certainly have enjoyed the past year and look forward to many more.

Well, I didn't make it to Ireland this year, but I did take a vacation to the states of Kansas and Colorado to visit with relatives and friends. I was very excited about the trip because I had not been to Gunnison, Colorado, and the family cabins along the Gunnison River for 18 years.

I was very glad that I took my 2 meter radio with me because I heard several of the local hams making plans for Field Day for the following weekend. Since I wanted to meet some of the locals, I volunteered my services as "gofer" (one who does whatever tasks need to be done). My time with Uncle Sam taught me never to volunteer, but I did anyway, and I'm certainly glad I did.

I met some of the most wonderful hams and families, and had a great time, too, both behind the mike of WØGYV (Whiskey Zero Gorgeous Young Virgin) and at the keyboard of the computer, logging and duping. The Field Day site was on a ridge at about 10,000 feet elevation with higher terrain to the north. The closest power line was probably five miles or more away, which made for a very quiet RF site. With two sections of tower to hold a triband beam, several sections of extension ladder to hang the 80/40 meter dipole, a 5-band vertical, and two generators (one for backup), the world was at our fingertips.

I'm not going to say how well we did, other than that all were happy with the results. During my two shifts of operation, I had the fortune to make many contacts, and took the time to chat a little, even though it may have been brief. Three stand out in my mind, two in New Hampshire and one in Kansas.

The first contact in New Hampshire was with the club station of the Great Bay Radio Association, the club I belonged to when I became a Novice, and the second was the club operating in the Mason, New Hampshire, area. One of the operators, NX1G, Craig Clark, and I usually talk daily on the Keene, New Hampshire, repeater when the weather is bad enough for him not to ride his motorcycle to work. It was sure nice to chat with him for a few minutes. The third contact was with a club station in Newton, Kansas. A former classmate and friend from my high school Class of 1958 had been the City Manager in Newton for a few years, but he had moved several years ago. I mentioned his name to the operator and received a very happy reply from the operator that he and his fellow operator both had known my friend very well. As we say, it's a small world.

Was it just luck that I happened to be the operator of the station when those contacts were made, or what? Was it luck that those contacts were even made? Was it luck that I just happened to get involved with a Field Day operation over 1,500 miles away from my home? Or is it a small world after all, and ham radio just makes it even smaller? I tend to think the latter.

I would like to thank Ken WAØTOJ, his lovely XYL, and all the other hams and families who made my 1990 summer vacation in Gunnison memorable. When you pass through, be sure to tune into the 147.12 GVARC repeater.

I plan to return to Gunnison next summer. I wonder if the dates will coincide with Field Day again. Time to start consulting my calendar.

For the rest of you hams around the world, get involved, have fun, and make the world a little smaller and a lot friendlier. Good things are happening and let's keep them happening.

—Arnie N1BAC

Roundup

Australia *From a letter by Ken Stevens VK5QW via Ted Melinosky K1BV.* In the June 1990 issue of *73*, we published the report that Ken VK5QW would be the new WIA Awards Manager. The report should have read that Ken was acting as a forward or collection point until a new manager was selected. The new WIA Awards Manager is Phil Hardstaff VK3JFE, PO Box 300, Caulfield South, Australia 3162. [*Our apologies, Ken, for any inconvenience this may have caused you.*]

Greece *From the Greek Mountaineers' Club.* The following describes a QSO in the 144 MHz band, using a large vertical limestone cliff as a reflecting surface.

The transmitting station, manned by Zafeiris Trompakas SV2AHT and Giannis Floros SV2AGY, was located near the top of Mount Olympus (Greece) at an altitude of approximately 2700 meters. They used an ICOM IC-02E with a 3-element beam and a ¼-wave vertical. The receiving station was located in Thessaloniki, Greece, at sea level approximately 80 km from the other station. Nikos Kosmaras SV2AHJ manned the station, using a Yaesu FT-227 and a ⅝-wave vertical.

Line of sight was not possible, just noise when the beam was pointed directly at the receiving station. When the beam antenna was pointed at the Stefani (Headband) Cliff near the top of Mt. Olympus, a 4-unit signal on the receiver's meter was observed. The transmitting station was approximately 0.5 km away from the cliff. [*See Photo A. What we hams don't do for fun! —Arnie*] Greek Mountaineers' Club, 5, Aristotelous Square, Thessaloniki 54624, Greece.

Japan *From the JARL News.* Commencing October 14, 1990, the JARL will hold a national FOX-teering competition in Hyogo Prefecture under the sponsorship of the Japan Amateur Radio Industries Association.

This sport, which is noticeably gaining in popularity, saw 270 participants last year, among whom were Chinese, Koreans and one American. However, since 180 applicants have sent in their applications [*as of May 1990*], the Executive Committee can well expect a number far surpassing this.

Paraguay *From the Radio Club Paraguayan Award Manager.* A complete listing of awards given by the club was sent for publication. The list is too lengthy to be printed here so you can find it on the *73* BBS in the "73 Intl SIG" called Paraguay Awards. The BBS information is located on the "Table of Contents" page.

Swaziland *From Newsletter No. 1 (May 13, 1990) from the Radio Society of Swaziland.* Following some gentle prompting from OM Peter ZS6ET [*73 Hambassador from South Africa*] late last year, OM Robin 3DAØAJ sent out a circular letter to all known amateur radio operators in Swaziland inquiring as to whether or not there was any support for a possible re-birth of a Swaziland radio society. Astonishingly, there was!

And so, on Sunday 11 March 1990, ten pioneers gathered at the home OTH of OM Willie 3DAØBD and established an Interim Committee of Management, tasked with the re-birth of the RSS. An Interim Committee of Management was elected: OM Willie 3DAØBD as Chairman; OM James 3DAØAW as Vice Chairman; OM Paul G4MSP/3DAØ as Treasurer; and OM Robin 3DAØAJ as Secretary. The Interim Committee has proposed an entrance fee of E5 and an annual subscription of E10. Application and fee

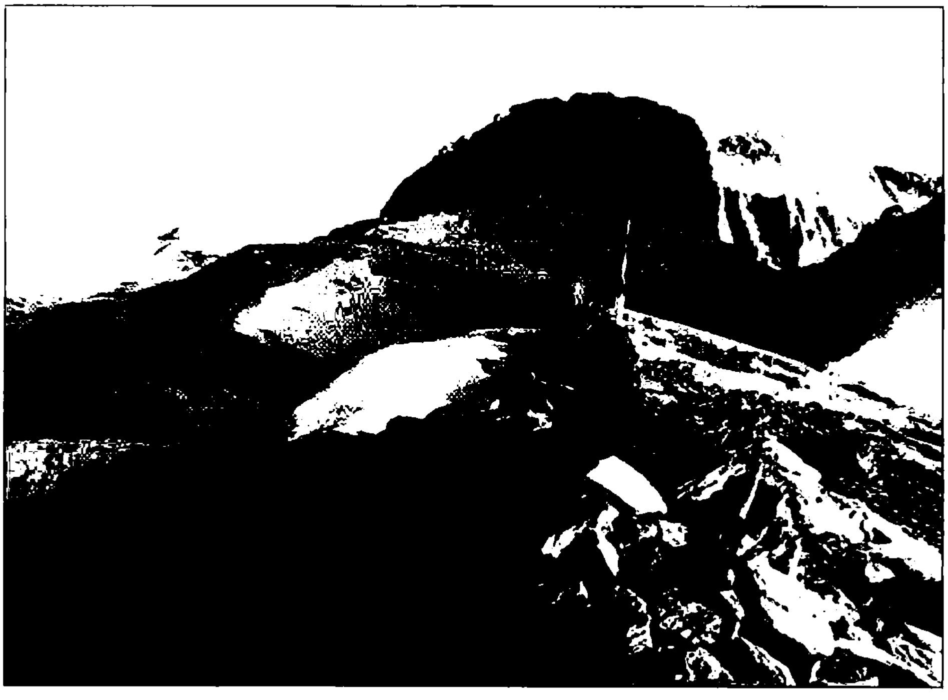


Photo A. The operating position on Mt. Olympus with the Stefani Cliff in the background.

payment can be sent to Robin 3DA0AJ, Box 23, Big Bend.

A 2 meter repeater on 145.6 is in the works *[if not already operating]* and there is a Tuesday Swazi Net on 3.675 MHz at 7 pm. The QSL Bureau, run by OM James 3DA0AW at PO Box 64, Manzini, is operating.

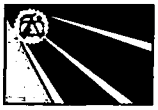
ISRAEL

Ron Gang 4X1MK
Kibbutz Urim
Negev MPO 85530
Israel
Packet: 4X1MK@4Z4SV

In this country of about 1,000 licensed radio amateurs, and maybe half that number operating an active station, 150 callsigns are registered users of the two packet radio BBSs here. Since it was first introduced in Israel only five years ago, this mode has grown in leaps and bounds.

A handful of dedicated packeteers, mainly in the Haifa area, had then started a BBS and digipeating, but as this computer-age mode caught on, the IARC took sponsorship of the packet network.

Today the two BBSs, 4Z4SV and 4X4HF, serve the north and center of the country respectively, one VHF-HF gateway station 4X1RU-1, and eight Net-Rom nodes, giving coverage from the northern border all the way down to the southern Negev desert highlands. With the exception of one amateur in Eilat, at Israel's southern tip, nobody is out of range of the network.



MOZAMBIQUE

Phil Gray KA7TWQ
c/o CARE, C.P. 4657
Maputo, Mozambique

Hello from Charlie Nine land! This is the first news letter from Mozambique and I hope they will continue on a fairly regular basis. For a little background, amateur radio existed in this former Portuguese Colony until Independence in 1974. But when the new government took over, armed resistance groups formed and fought a destructive campaign that continues to this day. Except for one case, no amateur activity has been permitted.

In October 1986, I was in Sudan when I learned my next assignment was to be Mozambique. I told my good friend and Sudanese ham, Dr. Sid ST2SA, about my hopes of setting up a station in Maputo. As one of only two or three amateurs in Sudan allowed to broadcast, and an ardent DXer, Sid knew more about the international scene than I did. He suspected I might be disappointed, as he hadn't heard of anyone broadcasting from C9 for years. When I got here in January 1987, it turned out he was only too right.

For the first few months I was so busy setting up the computer system for the Logistics Support Unit of the government agency in charge of emergency supplies that I had little time to think of anything else. A radio system existed, however, which tied our office in the capital with each of the 10 provinces, so by mid-1987 I had an official occasion to go to the Department of Telecommunications. There I met with Mr. Joao Jorge who was in charge of frequency allocation for the nation. With him was Mr. Flavio, his technical assistant. During the course of the meeting I found an opportunity to inquire about amateur radio. They explained how the internal hostilities that existed in nearly every province worked against any hope of radio transmissions not of official or military nature. Bad news but understandable. (Actually, Sudan was and remains in the same situation.) A few weeks later I was able to speak with Joao's boss, Rui Fernandes in his position of Director General. He was sympathetic and fully expected amateur service to begin again one day, but not soon.

In June of that year, the Dutch government informed us they had about $250,000 for a communications project if we were interested. Mozambique's telecommunication system is very shaky now but was nearly impossible at that time. With limited means of delivery, we needed to know when and where assistance was required so time and resources were not wasted. HF radio was the only way.

I wrote up a proposal to put 50 radios in the most accessible districts on the 10 provinces nationwide. I also included a section for ten packet radio stations—one for each provincial capital—to connect with our offices here in Maputo.

On my way out for home leave in February 1988, I stopped in Johannesburg to attend the Networking Conference presented by the Southern Africa AMSAT chapter. It was chaired by the president and attended by amateurs from South Africa and the region. There I met *73's* Hambassador to South Africa, Peter Strauss, as well as many other hams most anxious to assist Mozambique in any way necessary to get on the air once more. *[This is the end of Phil's first submission, and I'm certainly looking forward to more in the coming months and years.—Amie]*

NEW ZEALAND

Des Chapman ZL2VR
459 Kennedy Road
Napier, New Zealand

Kia Ora from ZL-land. By the time you read this, we will have conferred at our Annual Convention and NZART Annual General Meeting. Only two remits for discussion were turned in prior to the meeting, one requesting that the AGM direct NZART Council to develop a policy on the desirability or otherwise of Morse code being a test requirement to qualify for operation on frequencies below 30 MHz, as is presently the case. Should this regulation be challenged? The other remit takes the opposite viewpoint—it urges our council to take steps to ensure that the present standards be maintained.

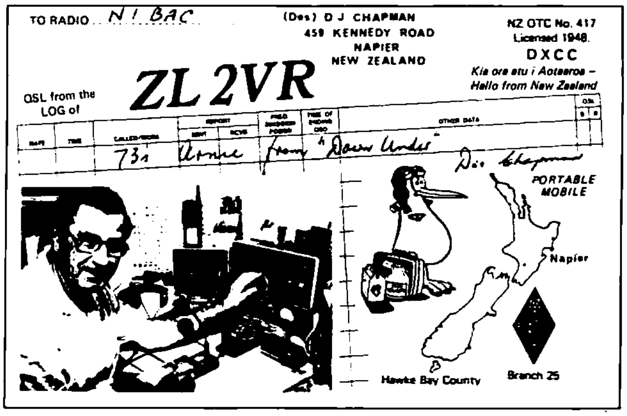


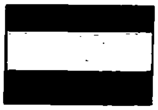
Photo B. 73 Hambassador Des Chapman ZL2VR and shack.

Of the constitutional remits, controversy is present regarding membership and nonmembership in NZART, some arguing that nonmembers derive the benefits of representation without paying their share of the costs. Others argue that the membership, which is about 50% of all licenced amateurs, are the voice for 100% of the licenced amateurs. 50% is a very high representation for a completely voluntary membership, considering that the international average of 1,799,000 licenced hams belonging to national societies is only 31%. What is very interesting statistically is that some of the largest countries have some of the lowest percentages of licenced hams belonging to their National Society. Why?

Just think of how much stronger our voice would be internationally if we had a greater percentage of licenced amateurs represented by our national amateur organisations. Membership is vital when our future is soon to be deliberated at an international conference (WARC) where, without proper representation, amateur radio might be 'stepped on' heavily by those with vested commercial interests in using the radio frequencies.

Enough of that... the Hastings Branch of NZART is sponsoring a 160m activity weekend, where the intention is to fire up the 160m band nationally and internationally to see what can be accomplished. The frequencies and dates are: 1840 and 1940 kHz ± on 20/21/22 October 1990, 0800–1600Z. No special rules, no QSLs unless requested; just fire up your rig and see how good conditions are on the band. Submit inquiries to ZL3DK, % NZART HQ, PO Box 40-525, UPPER HUTT, Wellington NZ.

And finally, congratulations to the Napier Branch on winning the NZART Field Day weekend operating contest. Napier had been close in past years, but had never managed to beat the "Big Gun" branches of the Aukland area. It's a bit like David and Goliath—Aukland has a population in excess of 500,000 and 8 NZART branches, while Napier has a population of 50,000 and one NZART branch. So you can see why Napier Branch is so pleased at last, winning this annual two-day weekend operation on 80 and 40 metres.



SPAIN

Woodson Gannaway N5KVB/EA
Apartado 11
35450 Santa Maria de Guia
(Las Palmas de G.C.)
Islas Canarias, Espana

My first visit to the Union of Spanish Amateur Radio Operators (Union de Radioaficianados de Espana, U.R.E.) clubhouse in Las Palmas was an eye-opener. First thing I heard was a theory class in progress with about 15 students. Nearby at the bar, several people were reading the latest issue of the U.R.E. magazine. In the next room, a packet station was shaping up. Lots going on.

The U.R.E. was able to get a special call for the Canary Islands Day (May 30) this year, an AM8–call. They broadcast from the same building that houses El Corte Ingles with the ED8SDR during the "Semana del Radioaficionado" (Amateur Radio Operator's Week) May 21–27. And each year during the International Fair (held April 23–29 this year) they set up a station at the fair and offer a diploma. They plan to operate during a commemoration in the month of November. Details will be reported as I receive them.

I'm still planning to go to Rumania in September so I am keeping up with the news with great interest. I am hoping to meet many hams there and bring you the latest news on the ham front.

Never Say Die

continued from page 4

tinued its growth, hurt our country? Are you even slightly critical of the League's monumentally poor PR effort? The League's score on this is near zero.

I am amused that the ham industry of the '60s was the major funder of its own demise. Now we're seeing the same pattern all over again as the ham industry of the '90s is enthusiastically and blindly paying for its destruction.

The Alternative

But what choice does the industry have? If they don't advertise in *QST*, how can they reach the ham market? *QST* has the largest circulation, so most advertisers are convinced they *have* to advertise there. If they have anything left in their ad budget they put it in *73* or *CQ*.

They could reach the active (buying) part of the market just through *73* and *CQ*, reaching the contest-oriented readers through one and those interested in new technologies and building through the other. You know, if the industry even cut their ads in half in *QST* and put them into *CQ* and *73*, you'd see some fast action at HQ to get started with the needed member services.

Of course it all comes down to money. If you do all your buying from *QST* advertisers, you're going to force them to continue to pay for their own suicide. If you make it clear to the industry that you are shopping in *73* and *CQ*, you'll bring about changes almost as fast as electing new directors. You might also help save *CQ*, which I'd hate to see go.

Some added advertising revenue won't hurt *73*, but all it'll do is help bring you a larger magazine. My music magazines are paying the freight quite well, so we aren't in any bind. *CD Review* was one of the fastest growing magazines in the country last year and should be again this year. It's fastest growing not only in circulation (up 40%), but also in advertising sales (up 34%).

There, you have something to talk about over the air other than the weather. Something to talk about at the next club meeting. Remember, about two-thirds of all hams don't read any ham magazines at all, so unless you tell them what's happening, they won't have a clue.

Now get busy getting your friends and fellow club members to oust the entrenched directors and start pushing the ham industry to stop shooting itself in the foot. And don't worry about ARRL President Larry Price, the new directors will make short work of him.

Ooops?

Well, while we hams can claim credit for inventing cellular radio, which is a result of the cellular repeater system set up in Chicago back around 1970, it's only logical that some service like this would have been developed even if we hadn't done the groundwork. It just makes sense that people would want to make phone calls from their cars.

Back when I was young, long distance phone calls were expensive. As a result I tended to avoid using the phone and used my typewriter instead. Cheaper. I still tend to avoid the phone, preferring my laptop computer, today's version of my old typewriter. Old habits don't die easily.

Phones in cars are normal now, even though they're far from inexpensive to use. I suspect this is because people in business today are so used to grabbing the phone, it normally being cheap to use, that the habit is as hard to break for them as mine is for me. Which is great for the cellular business.

The next step is obvious: personal phones. They're already trying 'em out in London, so they'll be along here soon. We'll be seeing cellular prices come down if the FCC ever permits competition. And that brings me to my favorite gloom and doom subject: frequencies.

I see in *EDN* magazine projections that today's $9 billion cellular business is expected to get up to around $150 billion within ten years. Think they'll do that without more frequencies? And who do you think is going to get the prime RF real estate and who'll be in the slums?

The FCC is run by Congress. And who runs Congress? You? Me? You know as well as I do who runs Congress . . . whoever has the money. We've seen how much clout firms who invest $10,000 in a senator or congressman get, imagine what kind of action the cellular radio industry might command if they set aside 2% of their revenues for five years to buy more frequencies. That's $15 billion they'd have to invest. Let's be cheap and only invest one third with the Senate. That's $5 billion split 100 ways, or about $50 million per senator.

Heck, that'd only leave about $20 million for each congressman. Still, that might be enough to counter several hundred tearful moneyless letters from hams.

Hey, there's an idea for a good business for hams to get into . . . making pocket-sized code oscillators so we can send Morse Code over our cellular phones to each other on our old ham bands.

Other Technologies

Things are going wireless. We're seeing wireless TV and audio distribution systems for homes. We're seeing wireless security systems. Computers are going wireless. Data links. Toys. There are community TV stations. HDTV is acoming. Local area radio information systems for traffic and shopping guidance. Wireless light switches and other remote controls for homes are on the way. The 1990s are going to bring us the biggest changes in electronics yet, and a bunch of it is going to need spectrum space.

We'll be able to do a lot with satellites . . . like keeping track of cars and trucks. We may even be able to use satellite links for communications, but I suspect that fiber optics will eventually provide lower cost service and phase out most of this. This'll give us more spectrum space for direct satellite digital TV and radio broadcasting. Ooops, there go our microwave bands! Oh well, we're not using 'em anyway, right? Big deal.

The Bright Side

Those of us who keep up with technology will be in a great position to take advantage of these new technologies as they come along. The equipment will be designed in Japan and built in Asia somewhere, but they're going to need us to sell, install and service it. They'll need technicians to operate the communications centers which will make all this stuff work.

Spread Spectrum

Though we hams are allowed to experiment with spread spectrum communications, we're still mostly hung up on CW and other old communications modes. I'm surprised I haven't seen any petitions sent to the FCC requesting the return of spark.

Spread spectrum, which was developed to help keep military communications secure, is now beginning to creep into everyday products. It's an easy way to have several wireless controlled things going on without them interfering with each other.

For instance, by building an encoder chip into a wireless light switch and a decoder chip into the light socket, you'll be able to control your light from almost anywhere, with any number of switches. The same technology will allow your garage door opener to open your door and not your neighbor's. It'll let you send several digital stereo signals around your house to speakers without interference. It'll give you privacy with your cordless phone. We should soon be seeing computer networking systems using spread spectrum. Most new spread spectrum products are using our shared 902 MHz band, by the way.

We'll be seeing wireless computer nodes and wireless networks, complete with repeaters to extend their range.

Medical applications will be along soon too . . . such as a monitoring unit for cardiac patients. If the monitor elects anything amiss it will dial the local phone and send the information automatically to the local hospital to bring help fast. This could help save hundreds of thousands of lives.

Musicians are already using digital spread spectrum so they don't have to trail wires around the stage. With these there is none of the occasional dropout experienced with the older FM analog technology.

They're already using the technology to send prices to grocery shelves for automated pricing. By next year we'll have digital audio quality, completely private wireless phones.

Interested?

If we publish some articles on spread spectrum in *73*, will you bother to read 'em? Or should we be looking for stuff on narrow-band spark rigs? Are you ready to put together some kits or do we have to get commercial companies to put it all together for you so you can buy it and plug it in? Please advise.

Is It Really Hopeless?

Of course not. The gloom and doom scenerio will only kick in if the ARRL members remain as paralyzed as they have for the last few years. If they refuse to re-elect any directors for two years we'll have a whole new deal. We might even get the League to lurch into action and save our bacon.

If you pull the old lemming act, blindly re-electing the same old do-littles, we're probably goners. I think even my bitterest enemies, like Bill Orr W6SAI, who is still angry with me for opposing Incentive Licensing 25 years ago, will agree on this one. 73

QSL of the Month To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock, NH 03449. Attn: QSL of the Month. Winners receive a one-year Subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

Above and Beyond

continued from p. 70

"ZERO." Stability of about 10 kHz over 24 hours was reported in one experiment. The kit Alan offers comes set for about 120 degrees F, but it can be changed or remotely set. Instead of using a coil of wire as I did, Alan used a power TO-220 mounted resistor in his circuit. The unit bolts to most sources using the existing UG-39 flange horn mounting screw. Complete kit with all parts, PC board and instructions is $20 postpaid from Alan Rutz.

Mailbox Comments

Richard K9RLS says he enjoys our articles, as they inspire newcomers to microwave to give it a try. He states that many articles are either too complex, expensive, or pie in the sky, but that mine was great! That kind of letter will make your hat size increase every time. I try to keep everything basic and easy to replicate.

I hope that I am providing you with a varied and useful source of information and will continue to do so till I run dry. I can't take credit for all the items that appear in this column (I am not that clever). I must rely on many others for their contributions and ideas which are used in a pass-the-information-along spirit. Without contributions from readers and members of our microwave group, this column would run flat. So keep the letters and questions flowing. I also want to publish any interesting photos you would like to share covering microwave or VHF topics.

I have the resources to make PC boards and a small darkroom to help with artwork and photo copying. It's kind of like being in twelve places at once, or wearing many different hats. It's cost effective to do the work yourself. Needless to say, this school of hard knocks was worth it. Vernon N4UL is planning to establish a full duplex repeater link using 10 GHz as the backbone. He is going to try wideband FM and see if it will do the job. He knows it will work, but would like more information on systems currently in use with AFC control for drift-free operation.

Scott VE7FYC of Vancouver, Canada, has a 10 GHz station in the construction mill. He states that the Northwest ARRL convention is not being held this year and he might come to the San Diego Convention. That's quite a trip. If you make it, Scott, I have to give you a tour of the surplus connections here in San Diego.

David WA4SNY in Lynchburg, Virginia, is also putting a 10 GHz wideband system together. He says, "I haven't played around with amateur microwave since my 2K25 system in the late '60s." Well, David, I hope you have as much fun with the newer equipment as you did with the tube systems. Newcomers should be aware that the tube systems of the sixties required klystron power supplies, which are like hauling two car batteries around. The newer solid state microwave equipment is so light in contrast that going mountain topping now is no longer a chore.

As always I will be glad to answer any questions on microwave or related subjects. Please include an SASE for a prompt reply. Chuck WB6IGP.

Number 25 on your Feedback card

Number 35 on your Feedback card

ATV

Ham Television

Bill Brown WB8ELK
℅ 73 Magazine
Forest Road
Hancock NH 03449

Return of ShuttleVision

Apparently the hydrogen leak has been fixed on the *Columbia* shuttle. If all goes well we may see liftoff of mission STS-35 sometime between the last of August or mid-September. This should coincide nicely with the beginning of school. Here's your chance to bring the shuttle video into the classroom. Live television from the shuttle, NASA Mission Control activities, and continuous coverage of the liftoff and landing are relayed via the NASA select channel on the SATCOM F-2 satellite, transponder 13.

Thanks to an agreement with NASA a few years ago, hams can receive these transmissions on a home satellite system and legally retransmit both the audio and video. In the May '90 "ATV" column in *73*, I mentioned that Tom O'Hara W6ORG was compiling a list of those groups or repeaters planning to retransmit shuttle video from the NASA select satellite feed. This list is being distributed as part of a SAREX information package so that interested schools can tune in. It's not too late to be added to this list (keep in mind that the next SAREX mission, STS-37, is still tentatively scheduled for November).

See the table for a current list compiled as of July 15 (included are a local 2 meter coordination frequency and a contact address). Send new entries or updates to Tom O'Hara W6ORG, 2522 Paxson Ln., Arcadia CA 91007.

ATV Travel Tips

Whenever I go on a trip to a new part of the country t try to find out if there is any ATV activity in the region. Whether you're just traveling through, camping out or staying in a motel, you can have a whale of a lot of fun making new contacts on ATV. They're out there; you just have to find them! ATVers are not easy to find; unless you know where they meet on 2 meters (or 220 MHz, etc.), you may be in a real hotbed of activity and never know it. You can try tuning around randomly with your TV receiver, but if you get lucky and actually receive a picture, you may not know where to contact the senders on voice.

In this column I plan to periodically list ATV groups and their operating frequencies for various parts of the country and even the world. This travel guide to ATV should help you make some very enjoyable contacts while roaming about. If your group would like to be included in this series, please send me your information at the above address. Please include your 2 meter (or whatever) talk frequency, list any activity nights or ATV club meetings, ATV frequencies (70cm, 33cm, 23cm, 13cm, 10 GHz, laser beam, etc.), polarization and any ATV repeater information. Also please send in photographs of members of your group and any activities using ATV. I promise to make you internationally famous!

"As more groups adopt a standard calling frequency, we'll see more interaction between nearby groups that may currently be unaware of each other."

Talk Frequencies

Two frequencies, 144.34 and 146.43 MHz, have been finding wide acceptance as national ATV coordination frequencies. As more groups adopt a standard calling frequency, we'll see more interaction between nearby groups that may currently be unaware of each other. It'll also help the traveling ATVer find the locals.

These frequencies have been chosen in order to minimize the effects of the third harmonic to your ATV receiver when you're talking on 2 meters (144.34 MHz minimizes interference to 439.25 MHz receive, and 146.43 is useful in areas with 434 MHz receive). The 146.43 MHz frequency is most popular in Southern California, Oregon and Washington State. 144.34 MHz seems to be most popular in the following regions of the Midwest and East Coast: Iowa, Missouri, parts of Michigan, parts of Florida, Wisconsin, Illinois, Indiana, Ohio (147.45 MHz also used); Erie, Pennsylvania; Buffalo, New York; and the Springfield, Massachusetts/Hartford, Connecticut, area.

A number of groups may be in local working range of each other, but they may not know about each other due to different talk frequencies. Hopefully we can ferret out all the many possibilities and get these groups talking to (and watching) each other! 73

SPACE SHUTTLE - NASA SELECT VIDEO REPEATERS - July 15, 1990 Compiled by Tom O'Hara, W6ORG

SITE LOCATION	CITY - AREA	ATV /ANT	2 METER	RPT CALL	CONTACT	ADDRESS
ARIZONA						
19th & Unionhills	Phoenix	427.25 V	145.170S	WV7K	Norm Sharpe	1817 W Wescott Dr Phoenix 85027
CALIFORNIA						
Bakersfield res.	Bakersfield	427.25 V	146.430s	N6TFO	Terry Godley	2701 Fordhyam Bakersfield 93306
Mt. Wilson	Los Angeles	1241.25 V	146.430s	K6KMN	Tom O'Hara	2522 Paxson Lane Arcadia 91007
Mt. Diablo	San Francisco	427.25 V	147.060+	W6NKF	Don Smith	1808 Rolling Hill Way Martinez 94553
La Cumbra Peak	Santa Barbara	1277.25 V	146.430s	WB9KMO	Rod Fritz	622 W. Mission St Santa Barbara 93101
East Sacramento	Sacramento	923.25 V	-	N6HOS	Jim Buckman	7454 Henrietta Dr Sacramento 95822
Sulphur Mtn	Ventura	1253.25 V	146.430s	WA6UCL	Alan Pettebone	2752 Machado St Simi Valley 93065
FLORIDA						
Beach & Orange Av	Daytona Beach	421.25 V	144.340s	K4BV	Victor Lesner	9 Venetian Circle Daytona Bch 32118
Kennedy SFC So	Merritt Island	434.0 V	146.940	K4GCC	John Anderson	POB 672 Merritt Island 32952
IDAHO						
Deerpoint	Boise	426.25 H	145.250	N7MOE	Brian Ray	3750 E. Overland Meridian 83642
ILLINOIS						
	Hillsboro	439.25 H	144.430s	K9SM	Scott Miller	907 Big Four Av Hillsboro 62049
63rd & Main	Downers Grove	426.25 V	-	K9ZNE	Len Bateman	6116 [illegible] Place Downers Grove 60516
MARYLAND						
Naval Academy	Annapolis	923.25 V	144.930s	WB4APR	Bob Bruninga	59 Southgate Av Annapolis 21401
MICHIGAN						
East Dearborn	Dearborn	1277.25 V	224.48	K8OCL	John Champa	7800 Hartwell St Dearborn 48129-1122
MISSOURI						
S.E. Joplin	Joplin	421.25 V	146.40s	WØTOR	Ron Coll	RT 2 box 615 Joplin 64604
OKLAHOMA						
Sand Springs	Tulsa	421.25 H	145.58s	WA5LVT	Mike Reynolds	POB 2650 Tulsa 74101
NEBRASKA						
CH6 Tower	Omaha	421.25 V	147.000	WBØHEU	John Geburh	2340 N [illegible] St Omaha 68104
NEVADA						
Mt. Potosi	Las Vegas	1253.25 V		KB7BY	Jeff Gomes	3208 Crystal Pool Dr Las Vegas 89117
OHIO						
Berwick School	Columbus	439.25 VH	147.450s	W8OMR	Bill Parker	2736 Floribunda Columbus 43209
OREGON						
Council Crest	Portland	1277.25 V	146.430s	WA7DRO	Dennis [illegible]	15630 SE Francis AV Milwaukie 97222

SPACE SHUTTLE - NASA SELECT VIDEO REPEATERS - July 15, 1990 Compiled by Tom O'Hara, W6ORG

SITE LOCATION	CITY - AREA	ATV /ANT	2 METER	RPT CALL	CONTACT	ADDRESS
TEXAS						
Downtown	Beaumont	421.25 H	145.470-	KE5O	Steve Gomez	686 Garland Beaumont 77705
-	Kilgore	426.25 V	145.450s	K5KFC	Dave Baxter	16105 Buckboard Tyler 76703
Cable TV Tower	Tyler	421.25 V	145.450s	W5KPZ	Dave Baxter	16105 Buckboard Tyler 75703
Co. Court Bldg	Richmond	1253.25 V	147.300+	N5ECP	Jeffery Salmons	309 So [illegible] Suite 629 Richmond [illegible]
WISCONSIN						
-	Wausau	421.25 V	144.340s	AD9W	Dean Andreopoulos	1204 11th St Mosinee 54455

ATV retransmission sites for NASA Select shuttle video (compiled by Tom O'Hara W6ORG).

DXDA '90
The Dynasty Grows . . .

***73 Magazine* welcomes the new members to the growing DX Dynasty Award cadre! Special thanks to DXDA chairman Bob Reed WB2DIN for processing the results. Congratulations to all for a job well done.**

BASIC AWARD—100 COUNTRIES WORKED

1. W1RFW
2. WB2DIN
3. KT1A
4. W3FDU
5. KA9JOL
6. WB1BVQ
7. NW7O
8. AK4H
9. W3HCW
10. KZ2W
11. K9FD
12. WD5N
13. KA9TNZ
14. K9GBN
15. N5GAP
16. WB3FMA
17. NN6E
18. AL7HG
19. N6CGB
20. KI6AN
21. K9JPI
22. N4WF
23. K6PKO
24. KW7J
25. VE6JO
26. WA4IUV
27. W4ZFE
28. N4KMY
29. WØHBH
30. K8KJN
31. KG1V
32. K1KOB
33. KY3F
34. PY2JY
35. YB5BEE
36. YB5BEH
37. WB9SBO
38. NØAFW
39. KA9MOM
40. N3II
41. W6DPD
42. KE8GG
43. VE6VK
44. KD9RD
45. W4WJJ
46. KØHSC
47. KI6GI
48. IK1APP
49. KJ4RR
50. K8MDU
51. N1EIU
52. K1DRN
53. WD8REC
54. ZL2BLC
55. VE3EFX
56. W9MCJ
57. N6IV
58. KN8D
59. KC5YO
60. WB6ITM
61. KA2AOT
62. K4LHH
63. VE2QO
64. KE5AT
65. W9SU
66. W3OOU
67. NR2E
68. KF5PE
69. N3FBN
70. KB4SJD
71. N3EZX
72. IK8GCS
73. WB4I
74. NG1S
75. WB7UUE
76. HK4EB
77. KØBFR
78. N7GMT
79. AA4VN
80. KA1LMR
81. N8AXA
82. NM2I
83. KD9YB
84. HC2CG
85. VE1BXI
86. YC2OK
87. N4GNL
88. GM3UBF
89. 5Z4BP
90. IØAOF
91. VE1BN
92. KA2NRR
93. 5Z4DU
94. KB8ZM
95. HK4CCW
96. W2JQ
97. HC2AGT
98. WD5N/M
99. VE1BHR
100. VE1AGZ
101. K5AOB
102. KW2D
103. PY3ARZ
104. WB4ETD
105. N2FPB
106. KD3CQ
107. K4NNK
108. VU2DNR
109. AA5BE
110. PY3OG
111. VE4ACF
112. VE4SI
113. PJ2KI
114. WB4CKY
115. W6EOB
116. KK4IY
117. IK1IYU
118. N6GCN
119. KB1AF
120. KB8BHE
121. KE2CG
122. VS6CT
123. G3IZQ/W
124. WB6FNI
125. KAØIAR
126. K9SM
127. W6BCQ
128. KA5MSL
129. WB4FLB
130. N7GLT
131. WAØX
132. KF4GW
133. N4QGH
134. VE1CBK
135. 7J1AAL
136. K6ICS
137. NZ7W
138. WBØN
139. WC7F
140. F6IFE
141. KL7N
142. KE8LM
143. WA6YOO
144. VE2MFD
145. N3APQ
146. HK1DBO
147. NM3V
148. IK6GFY
149. WB6UAN/M
150. NK6Z
151. KB6IUA
152. W9OKH
153. WB5FXT
154. NB3E
155. N2ESP
156. YU2EJU
157. OZ1DXX
158. IK5IIU
159. KA1ION
160. KD3AI
161. OK1AEH
162. W9LCR
163. 8P6SH
164. KA6SPQ
165. ZF2KH
166. W6MVV
167. JA8CAO
168. KI6WF
169. K2MRB
170. AA6GM
171. JAØSU
172. NU8Z
173. GØGRK
174. YB8VM
175. DV1BRM
176. WØTU
177. N7CNH
178. PY3IO
179. YBØZCA
180. YBØAF
181. VE3POB
182. W2SV
183. N1ADE
184. WP4AFA
185. KS7V
186. W2OFB
187. G4ASL
188. N5JUW
189. KA8WAS
190. 5NØWRE
191. AA4IP
192. JR5KDR
193. KD2WO
194. KA3NIL
195. WA8YWK
196. VE1ACK
197. HP2XVB
198. WB5KYK
199. N5JUJ
200. N4OBJ
201. 9Q5NW
202. KW2D
203. VE1HA
204. HP8BSZ
205. IK8JJQ
206. YC3DKN
207. I3VKW
208. K2EWA
209. KD3CR
210. N9GDG
211. KF8K
212. FD1BEG
213. DU1DZA
214. N8IMZ
215. KK4YA
216. LU1JDL
217. KA8YYZ
218. KA4TMJ
219. WA9DDC
220. YI1CIS
221. YC3FNL
222. GØFWG
223. KV4B
224. N5IET
225. WA9WIG
226. N3CDA
227. KE6KT
228. IK7DBB
229. JY5EC
230. N1ETT
231. PY2DBU
232. I8IYW
233. NØISL
234. KC4BEB
235. WA7QQI
236. KA1RJG
237. OZ9BX
238. KB4HBH
239. KA3RWP
240. NJ1T
241. W4DCG
242. YCØRX
243. VE7OJ
244. AA4W
245. N9GMM
246. KB4HBH
247. KM4HF
248. CE1YI
249. KA1FVY
250. N2GVB
251. N2DAO
252. WF8E
253. YBØHZL
254. N5MBD
255. N4SNS
256. KA3TGY
257. JN3XLY
258. N4DUV
259. KA9MRU
260. KA4OTB
261. N4JED
262. AB4KA
263. WA7OET
264. KA3RVH
265. CE7ZK
266. NI9J
267. WB9PTN
268. KB8DAE
269. WØCL
270. WB7VUB
271. JF6TUU
272. ZY3IO
273. KB4VIR
274. OE6CLD
275. N7JJQ/DU3
276. KK4FB
277. DU1AUJ
278. K2EWB
279. NI5D
280. N2JXC
281. NØIWT
282. WB3BDH
283. K1CVF
284. KA3CXG
285. KA1SPO
286. WA4NWT
287. KJ4OI
288. KA3UNQ
289. WB2VMV
290. KD4MM
291. OE3DHS
292. KD9HT
293. DL8OBC
294. G3KVA
295. WA4NEL
296. KA4VZO
297. NØIDT
298. KA1FUE
299. KD7EO
300. JH8MWW
301. KB8ICD
302. JA1CKE
303. N3GEE

150 COUNTRIES ENDORSEMENT

1. WB2DIN
2. N4WF
3. N6GCB
4. K9FD
5. NØAFW
6. N3II
7. WB1BVO
8. KA2AOT
9. KI6GI
10. N7GMT
11. IK8GCS
12. IK1APP
13. VE6JO
14. VE4ACF
15. WB4I
16. IK1IYU
17. KE2CG
18. G3IZQ/W1
19. WB6FNI
20. K8MDU
21. VE6VK
22. KB6IUA
23. WB5FXT
24. YU2EJU
25. IK5IIU
26. KE8LM
27. KA1ION
28. KA6SPQ
29. W6MVV
30. JA8CAQ
31. KI6WF
32. JAØSU
33. WD5N
34. W2SV
35. W6BCQ
36. F6IFE
37. VE2MFD
38. WP4AFA
39. 5NØWRE
40. KD2WQ
41. VE1ACK
42. N5JUJ
43. 9O5NW
44. KB8BHE
45. I3VKW
46. KD3CR
47. N8IMZ
48. GØFWG
49. N2FPB
50. KE6KT
51. OZ9BX
52. NJ1T
53. CE1YI
54. YBØHZL
55. JN3XLY
56. KA9MRU
57. CE7ZK
58. KB8DAE
59. K2EWB
60. NI5D
61. KD3CQ
62. KA4OTB
63. WB2VMV
64. KD4MM
65. KD9HT
66. KA3NIL
67. NØIDT

200 COUNTRIES ENDORSEMENT

1. N3II
2. WB2DIN
3. K9FD
4. IK8GCS
5. NØAFW
6. WB1BVQ
7. VE4ACF
8. KI6GI
9. N6GCB
10. K8MDU
11. YU2EJU
12. KE8LM
13. WD5N
14. F6IFE
15. 5NØWRE
16. KE2CG
17. I3VKW
18. CE1YI
19. W6BCO
20. CE7ZK
21. KB8DAE
22. K2EWB
23. KD3CQ
24. KD4MM
25. KD9HT

250 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. WD5N
4. K8MDU
5. KE2CG
6. CE1YI
7. CE7ZK
8. K2EWB
9. KD9HT

300 COUNTRIES ENDORSEMENT

1. WB2DIN
2. IK8GCS
3. K2EWB
4. K8MDU

Official DX Dynasty Countries List: 9/1/90

ABU AIL	A15
AFGHANISTAN	YA
AGALEGA ISLAND	3B6
ALAND ISLANDS	OHØ
ALASKA	KL7
ALBANIA	ZA
ALDABRA ISLAND	VQ9
ALGERIA	7X
AMERICAN SAMOA	KS6
AMSTERDAM ISLAND	FT/Z
ANDAMAN ISLAND	VU4
ANDORRA	C3
ANGOLA	D2
ANGUILLA	VP2E
ANTARCTICA	KC4
ANTIGUA	V2
ANTIPODES ISLAND	ZL
ARAN ISLAND	EJØ
ARGENTINA	LU
ARMENIA	UG
ARUBA	PJ4
ASCENSION ISLAND	ZD6
AUCKLAND ISLAND	ZL9
AUSTRALIA	VK
AUSTRIA	OE
AVES ISLAND	YVØ
AZERBAIJAN	UD
AZORES ISLANDS	CU2
BAHAMA ISLANDS	C6
BAHRAIN	A9
BAKER ISLAND	KH1
BALEARIC ISLANDS	EA6
BANGLADESH	S2
BARBADOS	8P
BEAR ISLAND	JW
BELGUIM	ON
BELIZE	V3
BENIN	TY
BERMUDA	VP9
BHUTAN	A5
BOLIVIA	CP
BONAIRE	PJ9
BONIN	JD1
BOPHUTHATSWANA	H5
BOTSWANA	A2
BOUNTY ISLAND	ZL
BOVET ISLAND	3Y
BRAZIL	PP-PY
BRITISH VIRGIN ISLANDS	VP2V
BRUNEI	V8
BULGARIA	LZ
BURKINA FASO	XT
BURMA	XZLL
BURUNDI	9U
BYELORUSSIA	UC
CAMEROON	TJ
CAMPBELL ISLAND	ZL9
CANADA	VE
CANARY ISLANDS	EA8
CAPE VERDE ISLANDS	D4
CAPRI ISLAND	IC
CAYMAN ISLANDS	ZF
CEDROS ISLAND	XF1
CELEBES	YB
CENTRAL AFRICAN REPUBLIC	TL
CENTRAL KIRIBATI	T3
CEUTA AND MELILLA	EA9
COUNCIL OF EUROPE	TP2
CROZET ISLAND	FT.W
CURACAO	PJ
CYPRUS	5B4
CZECHOSLOVAKIA	OK
DENMARK	OZ
DESECHEO ISLAND	KP5
DESROCHES	VQ9
DIEGO GARCIA	VQ9
DJIBOUTI	J2
DODECANESE ISLANDS	SV5
DOMINICA	J7
DOMINICAN REPUBLIC	HI
EAST CAROLINE ISLANDS	KC6
EAST GERMANY	Y2-Y4
EAST KIRIBATI	T32
EASTER ISLAND	CEØ
ECUADOR	HC
EGYPT	SU
EL SALVADOR	YS
ENGLAND	G
EQUATORIAL GUINEA	3C
ESTONIA	UR
ETHIOPIA	ET
EUROPA ISLAND	FR/E
FALKLAND ISLANDS	VP8
FAROE ISLANDS	OY
FAROUHAR	VQ9
FERNANDO DE NORONHA	PYØF
FIJI ISLANDS	3D2
FINLAND	OH
FRANCE	F
FRANZ-JOSEF LAND	UA1
FRENCH GUIANA	FY
FUTUNA ISLAND	FW
GABON	TR
GALAPAGOS ISLAND	HC8
GAMBIA	C5
GEORGIA	UF
GHANA	9G
GIBRALTAR	ZB2
GLORIOSO ISLAND	FR/G
GOUGH ISLAND	ZD9
GOZO ISLAND	9H4
GRAHAM LAND	VP8
GREECE	SV
GREENLAND	OX
GRENADA	J3
GUADELOUPE	FG
GUAM	KH2
GUANTANAMO BAY	KG4
GUATEMALA	TG
GUERNSEY	GU
GUINEA	3X
GUINEA-BISSAU	J5
GUYANA	8R1
HAITI	HH
HAWAII	KH6
HEARD ISLAND	VKØ
HONDURAS	HR
HONG KONG	VS6
HOWLAND ISLAND	KH1
HUNGARY	HA
ICELAND	TF
IFNI	EA9
INDIA	NU
INDONESIA	YB
IRAN	EP
IRAQ	YI
IRELAND	EI
ISCHIA	IC
ISLE OF MAN	GD
ISRAEL	4X
ITALY	I
IVORY COAST	TU
JABAL ATTAIR JAMAICA	6Y
JAN MAYEN ISLAND	JX
JAPAN	JA
JARVIS ISLAND	KH5
JAVA	YB
JERSEY	GJ
JOHNSTON ISLAND	KH3
JORDAN	JY
JUAN DE NOVA ISLAND	FR/J
JUAN FERNANDEZ ISLAND	CEØ
KALININGRAD	UA2
KAMARAN ISLAND	VS9
KAMPUCHEA	XU
KAZAKH	UL
KENYA	5Z
KERGUELEN ISLAND	FT.W
KERMADEC ISLAND	ZL8
KIRGHIZ	UM
KOREA	HL
KURE ISLAND	KH7
KUWAIT	9K
KWAJALEIN	KX6
LABRADOR	VO2
LACCADIVE ISLANDS	VU7
LAMPEDUSA ISLAND	IG
LAOS	XW
LATVIA	UQ
LEBANON	OD
LESOTHO	7P
LESSER ANTILLES	PJ
LEVANZO ISLAND	IF9
IBERIA	EL
LIBYA	5A
LIECHTENSTEIN	HBØ
LINE ISLANDS	T32
LITHUANIA	UP
LORD HOWE ISLAND	VK2
LUXEMBOURG	LX
MACAO	XX
MACOUARIE ISLAND	VKØ
MADAGASCAR	5R
MADDALENA ISLAND	IM
MADERA ISLAND	CT3
MALAWI	7Q
MALAYSIA	9M2
MALDIVE ISLANDS	8O
MALI	TZ
MALYJ-VYSTOSKIJ (M-V) ISLAND	4J
MALPELO	HKØ
MALTA	9H
MANIHIKI	ZK1
MARCUS ISLAND	JD
MARIANA ISLAND	KH2
MARION ISLAND	ZS2
MARKET REEF	OJØ
MARQUESAS ISLAND	FO8
MARSHALL ISLAND	KX6
MARTIM VAS ISLAND	PYØ
MARTINIQUE	FM
MAURITANIA	5T
MAURITIUS ISLAND	3B8
MAYOTTE	FH
MEXICO	XE
MIDWAY ISLAND	KH4
MINAMI TORI SHIMA	JD1
MINERVA REEF	A3
MIQUELON ISLAND	FP
MOLDAVIA	UO
MONACO	3A
MONGOLIA	JT
MONTSERRAT	VP2M
MOROCCO	CN
MOUNT ATHOS	SY
MOZAMBIQUE	C9
NAMIBIA	ZS3
NAURU	C2
NAVASSA ISLAND	KP1
NEPAL	9N1
NETHERLANDS	PA
NETHERLANDS ANTILLES	PJ
NEVIS ISLAND	V47
NEW CALEDONIA	FK
NEW HERBRIDES	YJ
NEW ZEALAND	ZL
NEWFOUNDLAND	VO1
NICARAGUA	YN
NICOBAR ISLAND	VU4
NIGER	5U
NIGERIA	5N
NIUE ISLAND	ZK2
NORFOLK ISLAND	VK9N
NORTH KOREA	P5
NORTH YEMEN	4W
NORTHERN IRELAND	GI
NORWAY	LA
OGASAWARA ISLAND	JD1
OKINO TORI SHIMA	7J
OMAN	A4
PAKISTAN	AP
PALMYRA ISLAND	KH5
PANAMA	HP
PANTELLERIA ISLAND	1H
PAPUA NEW GUINEA	P2
PARACEL ISLANDS	BY
PARAGUAY	ZP
PERU	OA
PETER 1ST ISLAND	3Y
PHILIPPINES	DU
PHOENIX	T32
PITCAIRN ISLAND	VR6
POLAND	SP
PONZIANI ISLAND	IBØ
PORTUGAL	CT
PRINCE EDWARD ISLAND	VE1
PRINCE EDWARD ISLAND	ZS2
PRINCIPE	S9
PRIBILOF	KL7
PROVIDENCIA ISLAND	HKØ
PUERTO RICO	KP4
QATAR	A7
RAPA ISLAND	FO8
REPUBLIC OF CISKEI	S8
REUNION ISLAND	FR
REVILLA GIGEDO ISLAND	XF4
RIO DE ORO	EA9
ROCKALL ISLAND	GM
RODRIGUEZ ISLAND	3B9
ROMANIA	YO
RONACDOR CAY	HKØ
ROTA ISLAND	KHØ
ROTUMA ISLAND	3D2
RUSSIA-SIBERIA	UA9-Ø
RUSSIAN S.F.S.R.	UA
RUSSIAN-URAL MT	UA9-Ø
RWANDA	9X
RYUKYU ISLAND	JR6
SABA ISLAND	PJ
SABAH	9M6
SABLE ISLAND	VE1
SAIPAN	KHØ
SAKHALIN ISLAND	UA9-Ø
SAN ANDRES ISLAND	HKØ
SAN FELIX ISLAND	CEØX
SAN MARINO	T7
SAO TOME	S9
SARAWAK	9M8
SARDINIA	IS
SAUDIA ARABIA	HZ
SCOTLAND	GM
SENEGAL	8W
SERRANA BANK	HKØ
SEYCHELLES	S79
SICILY	IT9
SIERRA LEONE	9L
SINGAPORE	8V
SINT EUSTATIUS	PJ
SINT MAARTEN ISLAND	PJ
SMOM	1A
SOCIETY ISLAND	FO6
SOCOTRL ISLAND	7O
SOLOMON ISLANDS	H44
SOMALI REPUBLIC	T5
SOUTH AFRICA	ZS
SOUTH GEORGIA ISLAND	VP8
SOUTH ORKNEY ISLAND	VP8
SOUTH SANDWICH ISLAND	VP8
SOUTH SHETLAND ISLAND	VP8
SOUTH YEMEN	7O
SPAIN	EA
SPRATLY ISLAND	1S
SRI LANKA	4S
ST BRANDON ISLAND	3B7
ST HELENA ISLAND	ZD7
ST KITTS	V44
ST LUCIA	J6
ST MARTIN ISLAND	FS
ST PAUL ISLAND	FT8
ST PETER AND PAUL ROCKS	PYØ
ST PIERRE ISLAND	FP8
ST VINCENT	J8
SUDAN	ST
SUMATRA	YB
SURINAM	PZ
SVALBARD ISLAND	JW
SWAN ISLAND	HRØ
SWAZILAND	3D6
SWEDEN	SM
SWITZERLAND	HB
SYRIA	YK
TADZHIK	UJ
TAIWAN	BV
TANZANIA	5H3
TASMANIA	VK7
THAILAND	HS
TINIAN	KHØ
TOGO	5V
TOKELAU	ZM7
TONGA ISLAND	A3
TRANSKEI	S8
TRANSVAAL	T4
TRINIDADE ISLAND	PYØ
TRINIDAD AND TOBAGO	9Y
TRISTAN DA CUNHA	ZD9
TROMELIN ISLAND	FR/T
TUAMOTU ARCHIPELAGO	FO8
TUBUAI	FO8
TUNISIA	3V
TURKEY	TA
TURKMEN	UH
TURKS AND CAICOS ISLANDS	VP5
TUSCAN ARCHIPELAGO	1A
TUTUILA ISLAND	KH8
TUVALU	T2
UGANDA	5X
UKRAINE	UB,UT,UY
UNITED ARAB EMIRATES	A8
UNITED NATIONS-NEW YORK	4U1UN
UNITED NATIONS-GENEVA	4U1TU
UNITED NATIONS-VIENNA	4U1VIC
UNITED STATES	W,K,N,A
URUGUAY	CX
USTICA ISLAND	IE9
UZBEK	UI
VANUATU	YJ
VATICAN CITY	HV
VENEZUELA	YV
VIETNAM	3W
VIRGIN ISLANDS	KP2
WAKE ISLAND	KH9
WALES	GW
WALLIS ISLAND	FW
WALVIS BAY	ZS6
WAYNE GREEN	W2NSD
WEST CAROLINE ISLAND	KC6
WEST GERMANY	DL
WEST KIRIBATI	T3
WESTERN SAMOA	5W1
WESTERN SAHARA	SØ
WILLIS ISLAND	VK9Z
WORLD BANK	4U2
YEMEN	4W
YUGOSLAVIA	YU
YUKON	VY1
ZAIRE	9O
ZAMBIA	9J
ZANZIBAR	5H1
ZIMBABWE	Z21

Number 38 on your Feedback card

BARTER 'N' BUY

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73 Flea Market*, Barter 'n' Buy, costs you peanuts (almost)—comes to 35¢ a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to the *Barter 'n' Buy*, Donna DiRusso, Forest Road, Hancock NH 03449 *and get set for the phone calls.*

HAM RADIO KITS & ASSEMBLIES for various *QST* & *73* construction articles. We also offer books and electronic components. For catalog, send legal size SASE w/45¢ postage or $1.00 to A & A Engineering, 2521 W. LaPalma #K, Anaheim CA 92801. BNB259

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Number 40 on your feedback card

RANDOM OUTPUT

David Cassidy N1GPH

I've been writing the back page column the last couple of months since Jim Morrissett K6MH moved back to California. Now it's my great pleasure to introduce our new Associate Publisher, David Cassidy N1GPH, who'll be writing this column from now on. David has some great ideas to revitalize amateur radio. With David's guidance and enthusiasm you can expect to see even more of the latest and greatest in the upcoming issues of 73. Take it away, David de WB8ELK

David Who?

Let's get the issue of my name out of the way right at the start, shall we? Yes, my name really is David Cassidy. No, I did not star in a TV sitcom in the 1970s. Yes, I have heard every joke you could possibly think of. 'Nuff said.

Not Just a Job...

I have been a ham for about 17 years. I recently joined the team here at Wayne Green Enterprises to work on some of the other projects Wayne has cooked up. He and I got to talking about amateur radio, *73 Magazine* (which I've read for most of the last 17 years) and the current state of the industry. I guess I stated my opinion a little too strenuously, because the end result of that conversation is that I'm sitting in my bed on a Sunday night, with a very expensive laptop computer in front of me, writing this column—instead of sleeping in blissful ignorance of such things as deadlines, page yields, budgets and the million and one other things Wayne pays me to worry about (I was never in the army, so nobody ever warned me about volunteering).

Still, this job IS as much fun as you think it is. Just this week I have tested two new antennas, assisted WB8ELK in launching a balloon carrying 2 meter voice and 70 cm ATV beacons (keep an eye on Bill's column for a report on this—about 70 hams all over the East Coast had a ball tracking this thing!), made reservations to travel to a West Coast hamfest, read countless interesting articles submitted for publication, had numerous packet QSOs with my Dad (WB1DSL) and my brother (N1HLR), played with more computer stuff than most folks see in a year, helped the *73* ad reps get five new pages of advertising, sat around and listened to Wayne's great stories, picked out all the neat stuff we're going to review from the stacks of new product announcements the manufacturers send us, arranged to have a new HF rig shipped to us, talked with my buddies N1GVA, N1GOJ and KA1UNW on 40 meter CW, blew up my old HW-101 (again), got my old Drake TR-4C working (again) and made some exciting plans for our 30th anniversary year. All this, in addition to the actual "work" part of my job. Thanks, Wayne! Now, about that new mobile rig we talked about...

What's Happ'nin'?

With the recent juggling of personnel here, you're probably asking yourself, "What's going to happen to *73*?" Well, nothing... and everything. We start our 30th year of publication with the October issue. To celebrate, we're redesigning the logo a bit, changing the name slightly (does anyone know how many different names this magazine has had in the last 30 years?), and planning a whole year of special events. Thirty years of anything is reason enough to celebrate, but we DO have an ulterior motive. We here at *73* are going to take a leadership role in revitalizing amateur radio.

Sure, we're still going to scream long and loud about the problems (and try to get you off your butts, away from your TV, and DOING something about it), but we also have a responsibility to lead the charge. If the ARRL is too busy patting themselves on the back, spending our money on trips to Arizona and forcing the FCC one step closer to dumping the whole Amateur Radio Service, then we—that's me and you—are going to have to do it. Let's remember how much fun amateur radio can be.

This column will never be the same from month to month. I might report on some hams doing great public relations work or running a successful licensing class, or I might rant and rave about some jerk who walked all over my 40 meter QSO (see below). I hope that at least I will be able to get some of you to start thinking... and acting.

If you have anything happening in your neck of the woods, let me know. Write to me here, or use the *73* BBS, or send some packet mail to me (N1GPH @ WA1WOK.NH). Whatever you've got to say, say it. Something going on that you don't like? Tell me. Even more important, let me know about the triumphs, big and small.

Back to School

As the summer vacation season winds down, we find the beginning of the school year approaching. Most kids are grumbling about having to trudge back to the classroom, but the students of Intermediate School 72 in Staten Island, New York, usually can't wait for classes to start. As long as it's Carole Perry's "Introduction to Ham Radio" class, that is.

It's with great pleasure that we welcome Carole Perry WB2MGP ("Mighty Good Professor") to our lineup of *73* columnists. If more teachers had her enthusiasm and willingness to promote amateur radio in the classroom, we'd have the largest increase of new hams in amateur radio history! Carole hopes to use the new column—"Hams with Class"—to help educate the public about amateur radio and promote it in a big way. Welcome, Carole... we're glad (and lucky) to have you on the team!

A Personal Message to W1AW

On July 9, 0130 UTC (that's 9:30 p.m. EDST on July 8, in case you can't remember how to convert UTC), your automatic bulletin on 40 meters came in on the exact frequency where I was in QSO with another New England station. I want to remind you that transmitting without first checking to see if the frequency is in use is a violation of FCC regulations (97.101, subpart B), and repeated offenses could result in suspension or revocation of operating privileges and confiscation of all transmitting equipment.

I left a message on your answering machine, but I guess you guys are too busy, planning all those trips and new offices and everything, to give me the courtesy of a reply (don't bother with an explanation—there is none).

Just a friendly reminder. 73

Number 41 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 Chateau Circle
Payson AZ 85541

The Best of the '90s

Probably the next-best conditions of 1990 will occur this month, in September. When September is over, compare it with March, as March may prove to have been the best month of all.

The equinox occurs on September 22. DX ought to last on the higher bands, 10–20 meters, until after dark on most days. You can also expect grayline DXing along the path of the terminator at the appropriate times of sunset and sunrise.

The worst conditions of the month will most likely be centered around the weekend of the 15th and 16th, but otherwise you can expect fair to good conditions on most days. During these times of very high solar activity, possible flares and solar upsets can occur at almost any time, so the chart only gives those days during which disturbed magnetic field conditions are most likely.

Old Sol is at his least predictable right now, so keep a sharp ear tuned to WWV at 18 minutes after each hour for the most recent updates on solar/terrestrial events. Full moon occurs on the 5th, and no eclipse of either sun or moon are happening this month. 73

EASTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	—	20	—	—	—	20	20	—	—	15	[illegible]
ARGENTINA	15	[illegible]	20	40	40	—	—	10	—	—	[illegible]	[illegible]
AUSTRALIA	[illegible]	20	20	20	20	40	[illegible]	20	—	—	—	[illegible]
CANAL ZONE	15	[illegible]	[illegible]	[illegible]	[illegible]	15	15	10	10	10	20	10
ENGLAND	20	40	[illegible]	[illegible]	40	—	—	15	10	15	15	20
HAWAII	[illegible]	15	20	20	[illegible]	[illegible]	20	20	—	—	—	[illegible]
INDIA	20	20	—	—	—	—	—	15	—	—	—	—
JAPAN	10	—	20	—	—	—	20	20	—	—	15	[illegible]
MEXICO	15	[illegible]	[illegible]	[illegible]	[illegible]	15	15	10	10	10	20	10
PHILIPPINES	15	—	20	20	—	—	20	[illegible]	10	—	—	15
PUERTO RICO	15	[illegible]	[illegible]	[illegible]	[illegible]	15	15	10	10	10	20	10
SOUTH AFRICA	[illegible]	40	20	20	—	—	—	—	10	10	15	15
U S S R	40	[illegible]	20	20	—	—	—	[illegible]	[illegible]	—	20	20
WEST COAST	[illegible]	[illegible]	[illegible]	40	40	—	—	[illegible]	[illegible]	[illegible]	[illegible]	20

CENTRAL UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	[illegible]	15	20	20	20	—	20	20	—	—	—	[illegible]
ARGENTINA	15	15	[illegible]	[illegible]	20	—	—	10	—	—	10	[illegible]
AUSTRALIA	[illegible]	15	15	—	20	[illegible]	40	20	—	—	15	10
CANAL ZONE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—	[illegible]	[illegible]	10	10	10
ENGLAND	40	[illegible]	40	—	—	—	—	—	15	15	20	20
HAWAII	15	15	15	20	20	[illegible]	40	20	—	10	10	10
INDIA	15	[illegible]	—	—	—	—	—	[illegible]	15	—	—	—
JAPAN	[illegible]	15	20	20	20	—	20	20	—	—	—	[illegible]
MEXICO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—	[illegible]	[illegible]	10	10	10
PHILIPPINES	[illegible]	—	20	20	—	—	—	—	[illegible]	[illegible]	—	—
PUERTO RICO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—	[illegible]	[illegible]	10	10	10
SOUTH AFRICA	—	—	20	20	—	—	—	—	15	15	[illegible]	20
U S S R	—	—	—	—	—	—	—	15	15	15	20	20

WESTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	[illegible]	[illegible]	15	20	20	20	—	20	20	—	—	15
ARGENTINA	[illegible]	15	15	20	20	—	—	—	—	—	10	10
AUSTRALIA	10	[illegible]	15	15	20	20	20	—	20	—	—	—
CANAL ZONE	10	15	[illegible]	[illegible]	[illegible]	—	—	—	10	10	10	10
ENGLAND	20	20	—	—	—	—	—	—	15	15	[illegible]	20
HAWAII	[illegible]	[illegible]	15	[illegible]	[illegible]	[illegible]	40	—	15	10	—	—
INDIA	—	15	20	—	—	—	—	—	[illegible]	15	—	—
JAPAN	[illegible]	[illegible]	15	20	20	20	—	—	20	—	—	15
MEXICO	10	15	[illegible]	[illegible]	[illegible]	—	—	—	10	10	10	10
PHILIPPINES	10	10	—	—	—	—	—	20	15	[illegible]	—	—
PUERTO RICO	10	15	[illegible]	[illegible]	[illegible]	—	—	—	10	10	10	10
SOUTH AFRICA	20	20	—	20	—	—	—	—	—	10	15	15
U S S R	20	—	—	—	20	—	—	20	20	20	20	20
EAST COAST	[illegible]	[illegible]	[illegible]	40	40	—	—	[illegible]	[illegible]	[illegible]	[illegible]	20

Notes: [illegible]

SEPTEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
						1 F
2 F-G	3 G	4 G	5 G	6 G	7 G	8 G-F
9 F-G	10 G	11 G	12 G-F	13 F	14 F-P	15 P
16 P	17 P	18 P-F	19 F-G	20 G	21 G	22 G-F
23 F	24 F-G	25 G	26 G	27 G-F	28 F	29 F-G
30 G						

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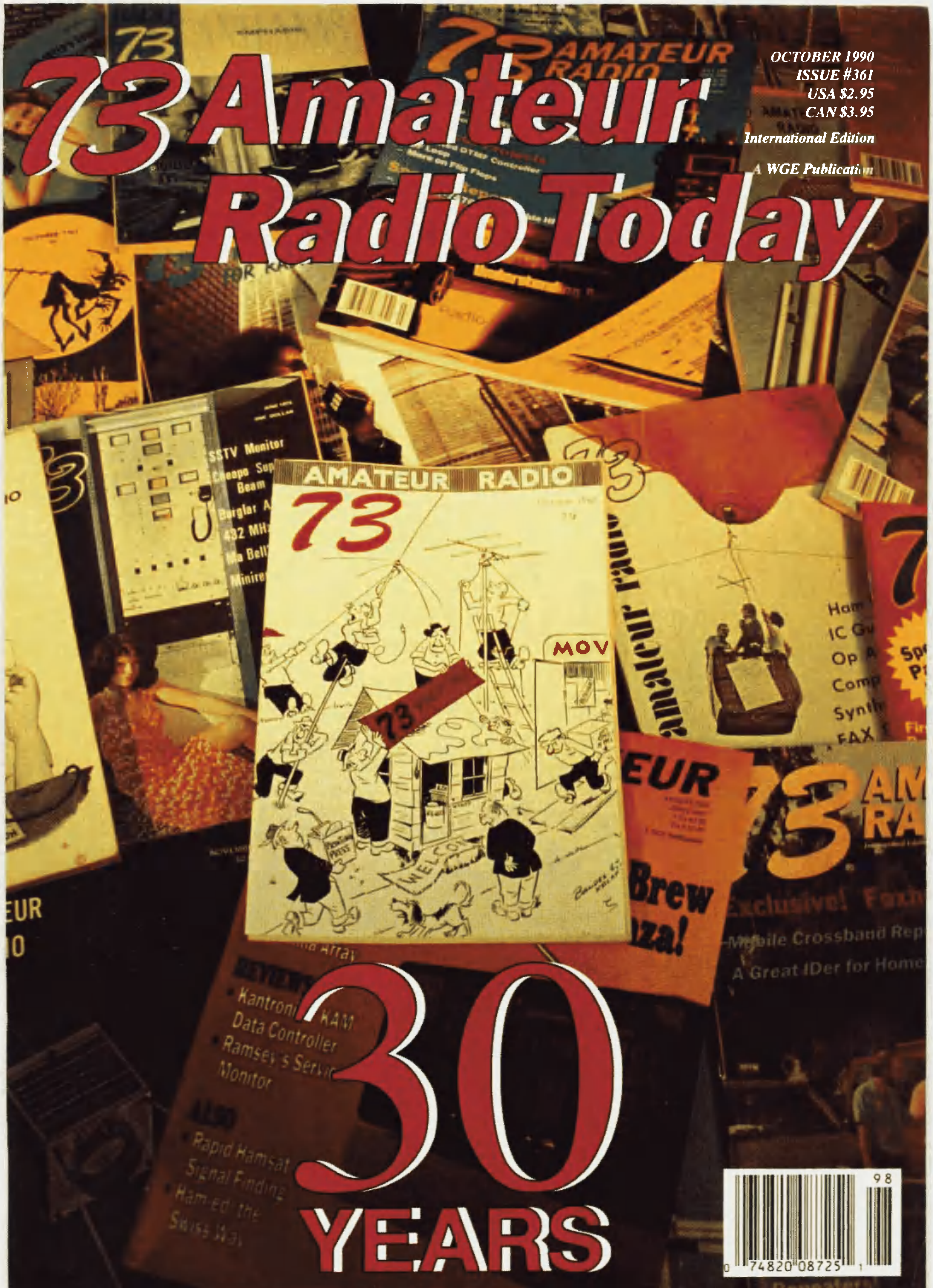

30 YEARS

Number 1 on your Feedback card

LETTERS

From the Hamshack

Bill Fisher N4IV, Reidsville NC: Wayne, thanks for taking the time to chat with me over the telephone last week. I enjoyed meeting you.

With any luck, we should have about 20 new Novices at the Reidsville Middle School this fall. Today the senior high principal told me that her head custodian and one of her assistant principals have requested release time so they can attend my class at the middle school!

We will have a reasonably well-equipped station. Donations so far include a Viking I and SX-71, a 32-V2 and NC-183, and an SB-101. We also have a 3-element yagi for 10m and a C-64 with a PC compatible likely. Now I've got to pick up a TNC and learn something about packet (I picked up the book from you).

On 10 July I ran demonstrations for the summer school students at Reidsville Senior High. We had seven very good phone QSOs and one CW QSO. Of the guys who gave their ages, the median was 76. Several students wanted to know if any young people were hams!

On 7 and 8 July I ran demos at the Elks Club Boys Camp in Zirconia, North Carolina. Fifteen meters was in fine shape, and the campers got to talk to several young-sounding hams in Japan, Canada, East and West Germany, the Soviet Union, France, and Bulgaria. The camp director wants to put in a ham radio program next summer. If you know a college kid who might like to work as a camp counselor in ham radio, could you ask him to get hold of me?

Wayne, I greatly appreciate all that you do for ham radio. Maybe we can blast the League off ground zero and get the hobby moving again. Thanks for your time and attention.

Bob Beattle KB6UBP/7, Klamath Falls OR: Just resubscribed to *73* after a couple of years . . . have missed your editorials. Doesn't matter if I agree or disagree with your opinions, at least you have some! Hi, hi.

Called your editorial offices yesterday for some badly needed information, and your staff was exceedingly helpful and thoughtful. Do want you to know your staff is every bit as pleasant and knowledgeable as the staff at Ten-Tec. This is a real accomplishment in this day and age.

I made a presentation to an elementary school principal here in Klamath Falls about the possibilities of an electronics/amateur radio class or club starting this September. He was favorably inclined to go with the idea, and we spent about an hour or so going over what ham radio is all about. My feeling is that if we can get 5th and 6th graders interested in amateur radio/electronics, continue the program through junior high and high school, then we have new skills, new jobs, and new paychecks in an area where clear-cut logging has destroyed the forest-related industrial base. The spotted owl thing is just a smokescreen for the fact that automation has come to the woods, and there will not be very many jobs available in the near future.

This is my second letter to you. The first was a couple of years ago. In that letter, I told you to read it if you had the time, or just throw it in the garbage if you didn't. Your staff assured me that you do read letters (poor man). My thanks to you for the magazine and to your staff for their help.

Yep, I read 'em all—quite a bunch, too, between about a dozen publications.

Do be sure to keep me informed on how you're making out with the school. If you get some Novices going, I want pictures.

According to the National Association of Record Merchandisers (NARM) who is fighting me on the longboxes for CDs, America's forests are being replanted at such a rate that there has been a net gain in forests. That wasn't what I saw when I flew over Oregon a couple years ago. I saw whole mountains of trees slashed and no visible reseeding.

Glad the staff was able to help . . . they're great.—Wayne

Stephen Crow WA2CPX, Ft. Lauderdale FL: Self-righteousness on public display doesn't have much appeal to us, especially when its broken-record brawl is turned up all the way. And in our time, "maximum" seems to be the only dial setting on 14.313.

How many years has it been now that we keep hearing the same shoddy holier-than-thou demonstrator on 20 meters? There he is, mouth wide open and screaming, words distorted in an ugly scowl, trashing somebody or something—now phone patching—then "rich yachties"—and generally carrying on in an aggressively obnoxious manner.

But it's for (fill in THE CAUSE here), so it's OK. Ladies and gentlemen of the audience, this noble idealist is acting like a thug and bully because he's awarded himself a moral blank check. Such behavior would get a 10-year-old spanked and his radio plug pulled. It is thought to be sanctified if done by an over-powered, over-driven, pseudo-politician claiming to be a champion of free speech. He and his ilk, one in Ft. Lauderdale, and two others in Florida and Arkansas, should have their composite power supplies short-circuited once and for all.

Unfortunately the trust of our system is such that means and methods from such evil sources can corrupt the most virtuous goals.

Certainly most listeners know that as they hear one of these temper tantrums parading by on their 20 meter dial, they're not hearing the idealist, but only an immature brat.

Wayne, now it has been many months continuing—are you still going to ignore this controversy?

Ignore the controversy? Me? If you'd go to the trouble to visit someone who gets 73, you'd see that I have not ignored this at all. I've mentioned FZ and his emotional problems several times . . . like last month, for instance.

I also proposed a simple, practical solution to the whole mess. You'll read even more about it in my next editorial.—Wayne

John T. Phillipp, M.D., N6ZAE, Glendora CA: In "The Hidden Receiver Hunt," by Robin B. Rumbolt WA4TEM in the July issue, he mentions the difference between true north and magnetic north. He says, "There is a difference. A call to your local airport should put you in touch with someone who knows what the difference (magnetic declination) is in your area. Pilots have to know that stuff. Here in Tennessee, the difference is one degree. Big deal, but I had to mention it."

Well, we pilots do indeed have to know that stuff. First, the difference is called the magnetic VARIATION, not declination. Second, here in Los Angeles, the magnetic variation is 14 degrees east; the magnetic heading is 14 degrees less than the true heading. Want to go due west (270 degrees)? You'll have to fly a heading of 256 degrees on your magnetic compass. If you fly 50 miles on a true heading, when you mean to fly on a magnetic heading, you end up 12 miles off course!

Just had to get that corrected, Wayne. I just got back into ham radio after almost 20 years away from it. I let my Advanced Class (WB2HYI) lapse many years ago (something about medical school and residency taking up most of my time). I came across an issue of *73* magazine a couple of months ago (I was surprised to see that it was still being published after all these years! And that you haven't changed a bit!) and the bug bit again. Boy, have there been a lot of changes! Volunteer examiners, books of questions, new bands . . . lots of new bands, satellites, packet, repeaters, microprocessor-controlled rigs, new privileges for the Novice Class. One thing hasn't changed, though. Morse code. Well, I got up to 20 wpm, and last week I passed the Extra Class exam. Hope to see you on the air.

Walter A.L. King N3EID, Hellertown PA: When I wrote my letter to Wayne, I did not expect to see it published in *73*. However, I am delighted that it did appear.

I would like to make two comments about the letter. When it was edited for publication, an important omission was made: I think I wrote that the crystal kit did *not* have the old-style crystal, but rather a diode with a germanium crystal fused in it. Please see the third paragraph in the published letter *[in the August 1990 issue, page 2.]*.

Secondly, about your comment . . . granddaughters. We were blessed with seven grandsons over the years, and only last fall did we enjoy the thrill of a baby granddaughter. When her time comes, and if I am still around, you can bet she will be in the radio shack and get the full treatment. I want folks to know that I am an equal opportunity granddaddy!

Keep up the fine work, and hello to Wayne.

Thank you for the correction; that line should have read, "They don't have the old-fashioned cat's whisker, but they do have a diode with a germanium crystal fused into it." Either a few words were accidentally left out or mistakenly erased, and I didn't catch the error in proofing. My mistake—and my apologies.

Your granddaughter is a very lucky girl.—Linda KA1UKM

Dick Goodman WA3USG, Mechanicsburg PA: I recently received the August issue of *73* and wanted to write to give you and your staff an "Attaboy." I have shown this issue to several young non-hams 15–18 years-old, and they have all responded enthusiastically. Most did not realize that hams did things like flying remote ATV helicopters, and launching ATV balloons and rockets with TV transmitters in them. Things like this get a lot more attention from the young than simply talking with other hams over a radio (even though they may be on the other side of the earth).

I cannot fault the young today, their frontiers are different and possibly more dynamic than ours were. Where we found it amazing to receive a weak, scratchy voice from a few thousand miles away, they take it for granted. The kids today are growing up in a high tech world, and much of what goes on in hamdom is not high tech.

There is nothing wrong with getting on HF and working contests, or rag-chewing on 40 or 75 meters, but the young are not interested in that.

Glad to see you're sharing the magazine with some young people. It's about time we stopped ***telling*** *kids how difficult ham radio is, and started* ***showing*** *them how much fun it is. We should all make it a priority to become someone's Elmer.—David N1GPH.*

Robert KC4RKJ and Lorraine Matthew N4ZCF, Santa Rosa Beach FL: *[Addressing the FCC:]* The formation of the Communicator license and the elimination of either the Novice or Tech to accommodate the new class will not do a thing for the hobby. It will bring in a few new people, but it will not build the number of ranks that you hope. A while back my son was watching my wife, who has gone from Novice to Advanced in six months, work DX. He was fascinated. We offered to help him get started and filled him in on what he would have to do. He commented that he would have to waste a lot of time before he could use the license to do what he would like to do. Also, it isn't a low-cost hobby.

As a high school teacher, I have encouraged young people to get involved in both radio and flying, but I've had little success. Both of these hobbies are desirable, but far out of reach of young people. It's too costly in time and money.

It seems to me that we should have a look at using the output power, not the code, as the control for various licensing levels. In Japan they have low-output radios that would allow more flexibility. It would encourage building equipment and antennas, even possibly the conversion of cheap CB units to the 10m band. We are one of the few countries that divides the bands up based on license class. This discourages many worthy people from entering the amateur community. DXers and clubs from foreign countries schedule events on frequencies inaccessible to most American amateurs. Let the amateur bands be more open to all license classes but on a power limit basis.

The code should be relaxed, but not eliminated in the acquisition of the more advanced classes. All types of transmissions should be encouraged.

I can visualize the last ham sitting in front of $20,000 worth of equipment and no one to contact.

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73 Amateur Radio Today

OCTOBER 1990
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Cover by Alice Scofield

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NEVER SAY DIE

Wayne Green W2NSD/1

Whew!

Thirty years! You know, it seems like a hundred and thirty, considering all the guff I've had to put up with. Yep, thirty years ago, up to my eyebrows in hock, I published my first issue of *73*. Oh, I tried to talk some wealthy hams into putting up money to back it, but they said it was a lousy investment. They were right. You know, I don't recall any year when *73* ever made any money. But then it didn't lose much either . . . not enough to be put out of its misery. When there was even a remote chance it might make money I'd print more pages and we'd be back in the red again.

I've often chuckled at my multitudes of detractors (who have always greatly outnumbered my tractors) and their unshakable belief that Wayne is out to make zillions out of amateur radio. Other than a few hams I shot down because they were out to screw other hams, I don't recall ever meeting an intelligent Wayne-hater. I've always written my editorials for thinking hams and figured the others should just make do as best they could.

I kinda fell into this publishing thing, back in 1951 . . . and I liked it. I repeat that old story every ten years or so. Since most of you are getting on in years and don't remember well, I'll remind you.

It had to do with me getting all het up over radio Teletype. You know, digital communications. This zapped me in 1949. By 1951 I was frustrated because no one was publishing a RTTY newsletter. That's when I went to work as a TV director at WXEL in Cleveland . . . where they had a semi-idle mimeograph machine! I was in business and soon had over 2,000 enthusiastic subscribers!

That led to a RTTY column in *CQ* and me becoming the editor in 1955. When they fired me in 1960, I said what the heck and started *73*. Yes, I could write a whole book about all that . . . and I probably will some day. I've had many interesting adventures . . . known lots of good guys and some rotten scoundrels. Most were interesting and really should get their rewards.

So, if it isn't money, why have I bothered to publish *73* all these years and a few dozen other publications? I started my first RTTY magazine because I was getting such a kick out of the hobby I wanted to convince others to give it a try and enjoy it with me. Heck, I started *73* in order to help share my love of building stuff. I'm still trying to shovel coal up that steep chute.

When SSB came along I was one of the first to try it. It was a ball! So I pushed SSB. When repeaters came along I put one up and wow! So I published hundreds of articles, lots of books, published a dedicated repeater magazine and held repeater symposiums all around the country. I watched a handful of converted obsolete taxi radios turn into the biggest single ham activity in the world . . . and then into a huge industry called cellular radio.

When the first microcomputer came on the market in 1975 (the MITS Altair) it was advertised first in *73*. I tried one . . . wow, again! That gave me the idea for *Byte* and I went on to build a microcomputing publishing micro empire.

"Will 73 be around in another 30 years? Only if amateur radio is around, and I'd give that maybe a 1% reality check, the way things are going."

These days I'm sharing my lifetime love of music with over 300,000 *CD Review* readers and they have Love Wayne and Hate Wayne clubs too. You should see what I have to say about rock'n'roll.

Though money was never a goal, I ended up making piles of it . . . kinda by accident. If you've read anything about entrepreneurs at all you know that few (if any) are money driven. I've often had people working for me who drew larger salaries . . . and when the till was running on empty, I'd put my savings back in again.

My goals today are modest . . . to try and breathe some life into the few smoldering embers of our once great hobby . . . to help break organized crime's control of the music industry . . . to help break organized crime's hold on the magazine distribution business . . . to help improve America's educational system and build it to where it can provide an inexpensive top-notch education for the entire world. That doesn't seem like much, so perhaps I should consider adding in world peace. Nah, too dangerous. I don't mind having The Mob irritated with me, but I sure don't want to ruffle America's military-industrial complex.

Some hams are resentful that my years of hard work got me some money. It's nice to finally have some, but I've tried to explain, if money is your goal, it's pathetically easy to make gobs of it. I've written about this for years in all of my magazines, urging everyone to try entrepreneurialism. It's fun and it can pay off better than any other route to success there is.

I really should write a book on how to be successful. Heck, people tell me I should write my autobiography . . . or one on how the microcomputer industry got started . . . and one on how the mind works and how to repair it. Sure, sure . . . right after I help get amateur radio going again and get the music industry fixed.

Will *73* be around in another 30 years? Only if amateur radio is around, and I'd give that maybe a 1% reality check, the way things are going. Of course, if you surprise me and stop re-electing the same tired old politicians as ARRL directors . . . but I'm dreaming, aren't I? Most of you are my age, so you know how it is to dream impossible dreams. Let's see, where did I put my lance? I've got to give that damned old windmill one more whack.

"Trashing" the League

If I were to suggest that we really might be able to do better than Bush as president or Bentsen as a Senator, would your reaction be that Wayne is trying to "trash" our government?

When I suggested that it was time to elect a new set of directors, I expected the same old knee-jerk response . . . Wayne is "trashing" the League. I got it, but I was disappointed. Perhaps the old timers who used to react that way to even the slightest hints that the League could be even marginally improved must have been smokers . . . and died. Chalk one up for the American cigarette industry.

It's too late to make any major changes this year, so let's get started toward cleaning up the mess we've allowed to turn into rotten, stinking garbage. Let's make 1991 the year we get some new and enthusiastic ARRL directors. Remember, half of those old . . . er . . . men come up for election every year, so by the end of 1992 we can have 15 new, bright faces (and maybe minds) in place and be on our way toward rescuing amateur radio . . . and perhaps our country.

Bush promised "No New Taxes" and got elected. Perhaps the rallying cry for hopeful new directors will be a guarantee to "Throw Out Price"!

For those of you with ultra-short memories, it wasn't long ago that the League promised to get us 50,000 new hams. Then Price and the directors did absolutely nothing to make it really happen.

Step One

One reason you keep re-electing the same old hacks every other year is a lack of information. All you get in *QST* is a totally sanitized version of what's happening, so you have no idea at all of what is really going on. Let's get started toward the first informed ARRL election in history. Let's make 1991 the year a new crew started moving into the League and cleaning house . . . starting with good old boy Price.

I understand from impeachable sources that there are just two directors who have the intelligence, business experience and true interest in amateur radio that we, the shareholders (ARRL members), might consider keeping in place as directors. What we all need is information, both about the incumbents and anyone new running for director. If you know of any reasons someone should (or shouldn't) be elected as director, put it in writing and send it to me.

Yes, I know, you're terrified that the League's legendarily brutal storm troopers will burn down your house and murder your children in their beds, so you personally don't want to take a chance on being identified as the fink who ratted on a director. Fear not, oh timid one, your secret testimony will die with me.

It's time you started looking around for some hams who are so deeply involved with helping amateur radio that they can be suckered into running for director. The requirements are simple . . . four years continuous membership and no connections with the ham industry. Yes, I know, this tends to rule out almost 100% of your club members, so it isn't going to be easy to find good candidates.

Continued on page 82

QRX . . .

EDITED BY LINDA RENEAU KA1UKM

Astronaut Callsigns

Mission STS-37 will probably have an all-ham crew. Linda Godwin N5RAX and Steve Nagel N5RAW received their callsigns last July, and Jerry Ross has agreed to obtain his Novice license at least by the time STS-37 flies. At present, that will most likely be in March 1991. Other members of the crew are Ken Cameron KB5AWP and Jay Apt N5QWL.

According to our latest report from NASA, STS-35 will take off no earlier than August 30 and no later than September 14. STS-38 will slip to November. *TNX Gil Carman, NASA.*

Museum Exhibit

Tampa's Museum of Science & Industry, with the help of local hams, hams across the U.S., manufacturers, and the local Armed Forces Communications and Electronics Association (AFCEA) chapter in Tampa, Florida, has built a working ham radio station on the premises. For several years, Clark Evans WA4DLL worked persistently to accomplish this, finally enlisting the moral support of prominent hams such as retired Senator Barry Goldwater K7UGA and publisher Wayne Green W2NSD. Letters from these men coupled with the efforts of others helped secure the museum administration's support.

Yaesu donated a complete top-of-the-line station and many accessories. Mosley Antennas chipped in with a 3-element yagi array, and Stewart Schneller K4JOP, a local ham, donated a 30-foot tower. Schneller and other hams also donated many hours of labor to install the station.

Daily, volunteer operators from the MOSI Radio Club are introducing Bay Area youngsters to worldwide HF amateur communications, and encouraging them to take up the hobby. *TNX Greg Grambor WB2GMK.*

Flexibility in Testing

Volunteer Examiners may now use more flexible procedures in testing the handicapped or disabled provided the candidate presents a doctor's letter describing the disability.

The procedures are, *only where warranted:*
1. A sending test (instead of a receiving test).
2. Pausing the tape to allow the candidate to *speak* what he has copied. More specifically, *where warranted*, volunteer examiners may pause the tape after: phrases/sentences; groups of words; individual words; or, in extreme cases, single letters.

If the above accommodations do not overcome the handicap or disability, the candidate can send the FCC a Waiver Request Letter and a Doctor's Certification letter, in prescribed FCC format, for waiving the 13 or 20 wpm requirement. (The 5 wpm requirement may *not* be waived.) The decision to grant a waiver is the prerogative of the FCC.

For more information and sample forms, see the August 1, 1990 issue of the *W5YI Report*, or contact your local VE team. *TNX Barbara Weirich KB2IWN for sending the ARRL letter, and the* W5YI Report *for additional information.*

Six Meter Plan

Southern California has adopted a new 6 meter band plan. Last March the Southern California Repeater and Remote Base Association sponsored a meeting in Anaheim, California, which was attended by representatives of all Southern California 6m band users' groups. After much discussion, they unanimously adopted a 50–54 MHz band plan.

Highlight of the new plan is a "modular" approach. (Based on Rule Making [RM] petitions from Southern California, the FCC had increased the repeater spectrum on 6 meters from 52–54 to 51–54 MHz.)

Recognizing that the pattern of band use for repeater communications depends on whether TV channel 2 (54–60 MHz) is broadcasting, the Southern California plan divides the 51–54 MHz repeater spectrum into three 1 MHz blocks. Each block will be coordinated separately, contain simplex and special-use channels, and have an input/output spacing of 500 kHz; inputs in the lower 500 kHz and outputs in the higher. The primary FM simplex will remain 52.525 MHz. The plan for the first megahertz of the band, 50–51, generally follows established practice. For details and a copy of the band plan, contact SCRRBA, P.O. Box 5967, Pasadena CA 91117. *TNX John Haserick W1GPO.*

Twenty Meter Trouble

The FCC has received many responses to its request for a plan to resolve the interference, controversies, and prolongued on-the-air rantings surrounding net, phone patching, and bulletin operations, especially on the above band.

This is the second phase of the inquiry. Last year the FCC mailed a fact-finding letter to 19 net and bulletin service participants. Based on the responses, the agency mailed another letter to nine net managers, asking them to come up with a plan. FCC Special Services Division Chief Robert McNamara warned that if the FCC had to intervene to solve the problems, it could result in "additional restrictions that may affect all amateur operators."

Regarding the responses from the HF nets, FCC Personal Radio Branch analyst William Cross said that the letters indicate common areas, but disagreement on what action to take. But compared to last summer, the problem is subsiding. Some of the nets that left 14.313 have returned. Cross believes that the HF inquiry has raised general awareness of the rules.

Bulletins are a difficult regulatory area. Cross says the amateur community has to decide for itself, rather than ask the FCC to discriminate among stations. At present, the FCC is continuing to study the responses and trying to find out whether or not there is any agreement about what actions should be taken. *TNX W5YI Report.*

Ham Memorial

A granite monument will be dedicated to honor hams who died while performing in a civilian amateur radio public service communication network. The dedication ceremony will be on August 25, 1991, at the ARRL Convention in Saginaw, Michigan. The name, call, date of death, and the event in which the amateur was participating at the time of death, will be engraved on the monument.

If you know of someone who should be included on the monument, please send a nominating statement to: Monument Committee, 1991 National Convention, %J. Turner K8CQF, 423 N. Granger St., Saginaw MI 48602. Your statement should include the complete name of the deceased, their call at the time of death, the date of the death, a brief description of the circumstances surrounding the death, and supporting evidence, such as media reports and testimonials.

Construction of the monument will cost about $20,000. If you wish to contribute, make your check payable to the National Monument Fund.

Forty Meter Move?

Frequencies on the 40 meter band may be moved to keep the band from being lost to other service interests. Radio Netherlands' "Media Network" reported July 5 that negotiators for amateur radio interests have agreed on a possible re-alignment of 40 meter sharing with international broadcasting use. The U.S. Industry Advisory Committee Working Group tentatively agreed to propose to the FCC that amateur allocation be moved down to 6.950–7.250 MHz on an exclusive basis worldwide. International shortwave broadcasters would then move up to 7.250–7.750 MHz on the same basis.

The FCC will take the proposal into account, along with proposals from other spectrum users, to prepare the papers on the position of the U.S. at the WARC '92 and '93 conferences. If accepted, the move may lessen interference to amateur communications on that band—*if* international broadcasters abide by the agreement. On the other hand, it would render many pieces of ham gear obsolete. At the least, it would give amateurs the opportunity to re-evaluate how or whether they want to partition the band by mode.

The FCC could ignore the proposal or suggest a modified version. After that, it's off to the Plenipotentiary of the International Telecommunications Union, where each nation holds one vote on every issue. This is where the survival of 40 meters—and possibly other amateur radio allocations—will be determined. This is also where amateurs have the least influence, since they are not directly represented and can only lobby for their interests. *TNX Westlink Report, July 20, 1990.*

Dual Voltage Bench Supply

Versatile solution for your power supply needs.

by Hugh Wells W6WTU

When I get involved in projects, I never seem to have enough power supplies to go around. When one's available in my shack, it's usually the wrong voltage, or it lacks a feature I need for the project. Building this versatile supply solved my power supply problems.

Multiple Applications

This power supply provides a fixed 5-volt output suitable for TTL logic and a variable voltage output ranging from about 1.2 volts to 21 volts, which is suitable for almost anything else. In addition, variable current-limiting protects the power supply components and the project.

For example, you can set the maximum desired current for charging a NiCd battery. You can also use it to tune up an RF power amplifier, since it's desirable to limit the maximum circuit current draw to a safe value to protect the transistor.

You can measure current and voltage with one meter. Two meters may be more convenient for simultaneous measurements, but this one is easily switched. If you buy all the parts new, the supply costs about $53.

When switched to *current*, the meter indicates the total current drawn from both the fixed and variable circuits. In the *voltage* position, the meter indicates the voltage output only from the variable regulator.

The Circuit

The power supply was designed around the ever-popular LM317 and LM340-5 (7805), three-terminal regulator ICs. See Figure 1. In Figure 2, a pictorial wiring diagram gives a conversion perspective from a schematic to the actual hardware wiring. Color-coded wires in the diagram indicate the circuit relationship between the schematic and pictorial diagrams. See the table for a separate component listing.

The operation of each regulator is conventional for three-lead devices, except for the current-limiting feature added to the LM317 circuit.

The LM317

Before describing the current-limiting feature of the supply, it is worthwhile reviewing

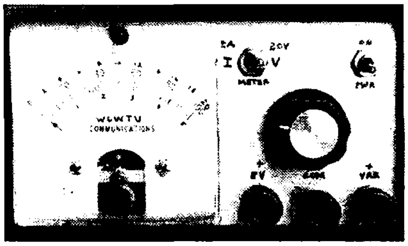

Photo A. Front panel of the supply.

Photo B. Internal wiring; note the position of the LM317, site of the only critical factor in assembly.

the voltage control characteristic of the LM317. The three terminals of the LM317 regulator are INPUT, OUTPUT, and ADJUST. At the lowest regulated output, the voltage differential between the INPUT and OUTPUT terminals must not exceed 40 volts. In other words, the power transformer's output must not exceed 28 Vrms, which at peak would produce 40 VDC across capacitor C6. Typically, an 18–26.5 volt transformer would be used with the LM317. When the output voltage is adjusted to the highest amount, the voltage differential from input-to-output of the regulator is at the lowest possible value. At that time, the regulator must have an input-to-output differential (headroom) of at least 3–4 volts to remain in regulation.

The third terminal, ADJ, of the LM317 is for controlling the input-output voltage differential to a value below the maximum regulated output voltage to a minimum of 1.2 volts. Regardless of the output voltage, approximately 1.2 volts (essentially constant) will be automatically developed between the ADJ and OUT terminals. If the ADJ terminal is allowed to float (open circuit) along with the output terminal, the output voltage will rise to

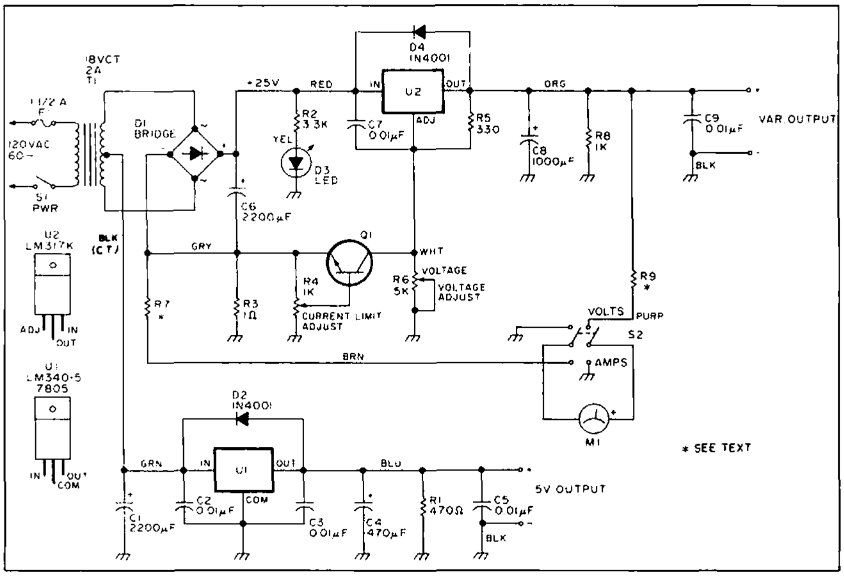

Figure 1. Power supply schematic diagram.

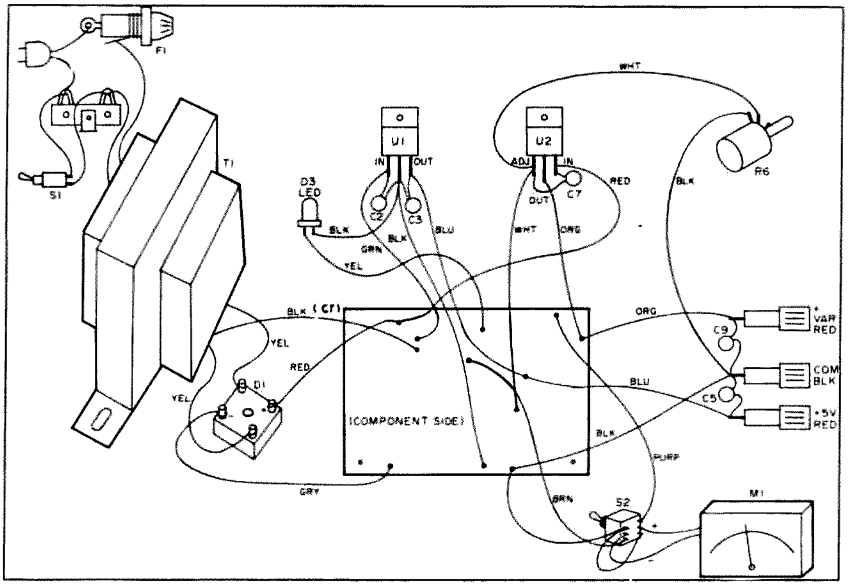

Figure 2. Wiring diagram.

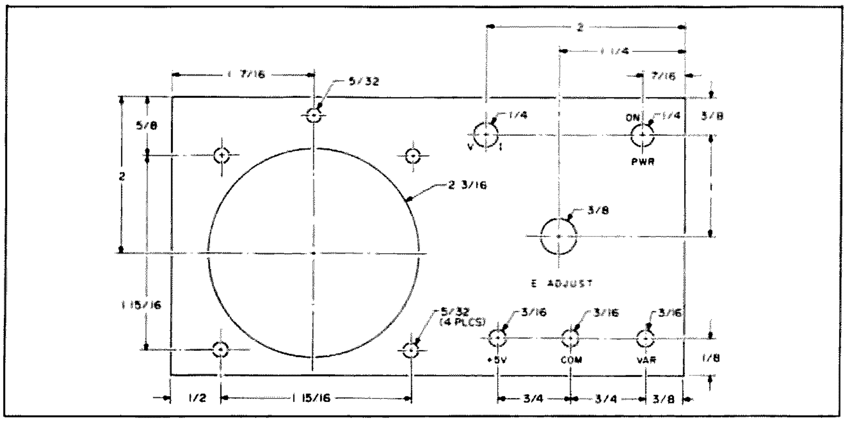

Figure 3. Front panel layout.

maximum and regulation will not occur, but the 1.2 volts will still be present between the ADJ and OUT terminals.

Regulation begins to take place only when the ADJ terminal is pulled down, causing the IC to maintain a 1.2 volt differential between the ADJ and OUT terminals. With a pot connected between ADJ and ground, the power supply output can be controlled (regulated) from 1.2 volts up to about 4 volts less than the DC input voltage to the regulator. In other words, if the maximum unregulated input is 25 volts, the regulated output would be 21–22 volts.

Now, to limit the output current of the power supply, it is only necessary to pull the ADJ terminal toward ground when a selected current value has been reached. You do this by passing the total supply current through a 1-ohm resistor which will produce a 1-volt drop per amp of current flow. Placing a pot across the 1-ohm resistor allows a specific voltage, as a function of current, to be selected and supplied to the base-emitter junction of an NPN transistor.

This voltage, in turn, is used for electronic

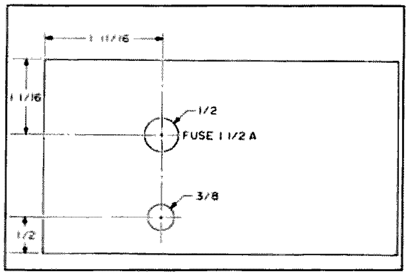

Figure 4. Rear panel layout.

pull-down of the ADJ terminal. In operation, as the supply current rises, so does the transistor's base-emitter voltage. As it approaches 0.7 volts, the transistor begins to conduct and begins pulling down on the ADJ terminal. The power supply output current remains essentially constant under limit-control even though the output voltage decreases as ADJ is pulled down.

For my power supply, I selected a horizontal, open-case, TV-type current-limit adjust pot, mounted flat on the circuit board. However, you could mount a pot with a shaft on the power supply's front panel for accessibility.

Another feature of the supply is reverse bias protection for the regulator ICs, accomplished by diodes D2 and D4. Most solid state regulators require the input voltage to remain higher than the output voltage as long as power is applied. Under normal conditions, this is fine. However, under some operating conditions, the supply power could accidentally be terminated, causing the regulator's input voltage to fall faster (to a lower value) than the output voltage.

This might occur when large value capacitors or NiCd batteries are attached to the supply's output terminals. A few moments after power loss, the regulator could be subjected to a reverse bias, resulting in internal

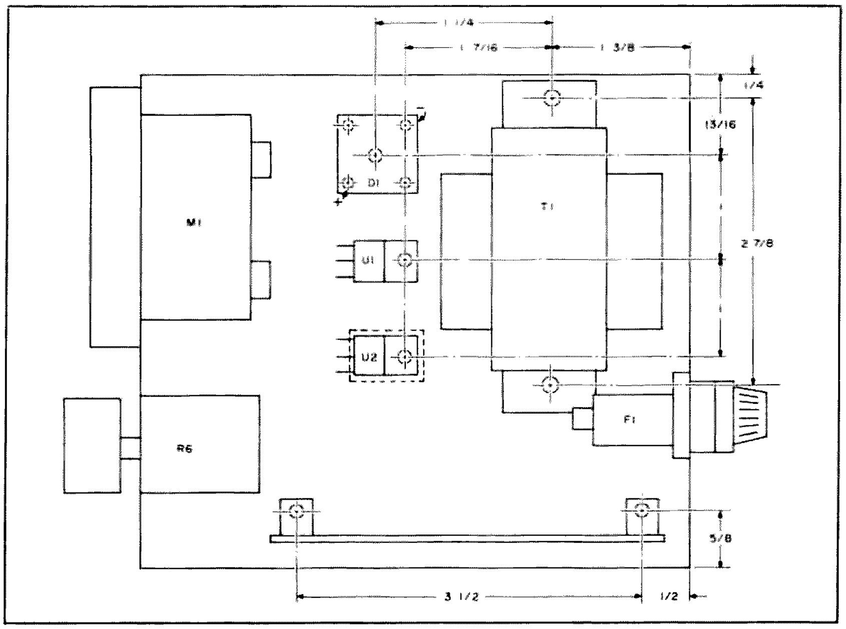

Figure 5. Placement of the major components.

regulator damage. By placing a diode from the output to the input terminal of the regulator, the regulator is protected; the input terminal voltage can never fall more than about 1 volt below the output terminal.

Metering

For displaying the voltage and current, I installed a 2½-inch plastic case 0–1 mA meter, which I had obtained from a local swap meet, on the front panel. However, nearly any panel meter having a full-scale current value of 10 mA or less (preferably less) will work as long as multiplier resistors R7 and R9 match the meter sensitivity and provide full-scale voltage/current value.

I found it desirable to use two resistors in series to obtain R7, and three resistors in series for R9. The 0–1 mA meter's sensitivity is 1000 ohms/volt; for a 20-volt, full-scale reading, resistor R9 would be nearly 20,000 ohms with an actual value of about 19,120 ohms. The value can be made by series connecting three resistors having values of 15,000, 3,300, and 820 ohms. If needed, you can add new scale markings to the dial face with a very fine point, felt tip pen. The scale could be marked 0 to 20 to accommodate both the 0–2 and 0–20 ranges.

If you select the Radio Shack 0–15 volt panel meter, you can use it as is for a voltage range of 0–15 volts and a current range of 0–1.5 amps. In other words, the multiplier resistor provided with the meter will satisfy the value R9 needs. However, for the current measurement, the value of R7 (approx. 1KΩ) would have to be determined to provide a full-scale current value of 1.5 amps. It would also be necessary to re-mark the dial face for full-scale values different from those provided by the 0–15 indication. *[Ed. Note: A 20k pot can be substituted for R9 and a 2k pot for R7.]*

Construction

Before assembling the power supply, I drew full-size layouts of the chassis and hole patterns as shown in Figures 3, 4, and 5. The drawings provided me with a clear picture of how things were going to fit together before I drilled any holes.

Figure 6a is a drawing of the printed circuit board for mounting the components. You can make a printed circuit board from the drawing, or use perforated board material, as indicated in the parts list. Either way, the board material is fastened to the chassis with two ½-inch long, 1/32-inch thick aluminum "L" brackets cut and bent from scrap material. Figure 6b shows parts placement.

The only critical item in assembly concerns the insulation (plastic or mica) and the thermal grease placed between the LM317 and the metal chassis. Care must be taken to remove any burrs from around the mounting screw hole to prevent a short from occurring between the LM317 mounting tab and the chassis. The regulator tab remains electrically isolated from the chassis, but it must be in close enough contact with the chassis to transfer heat readily.

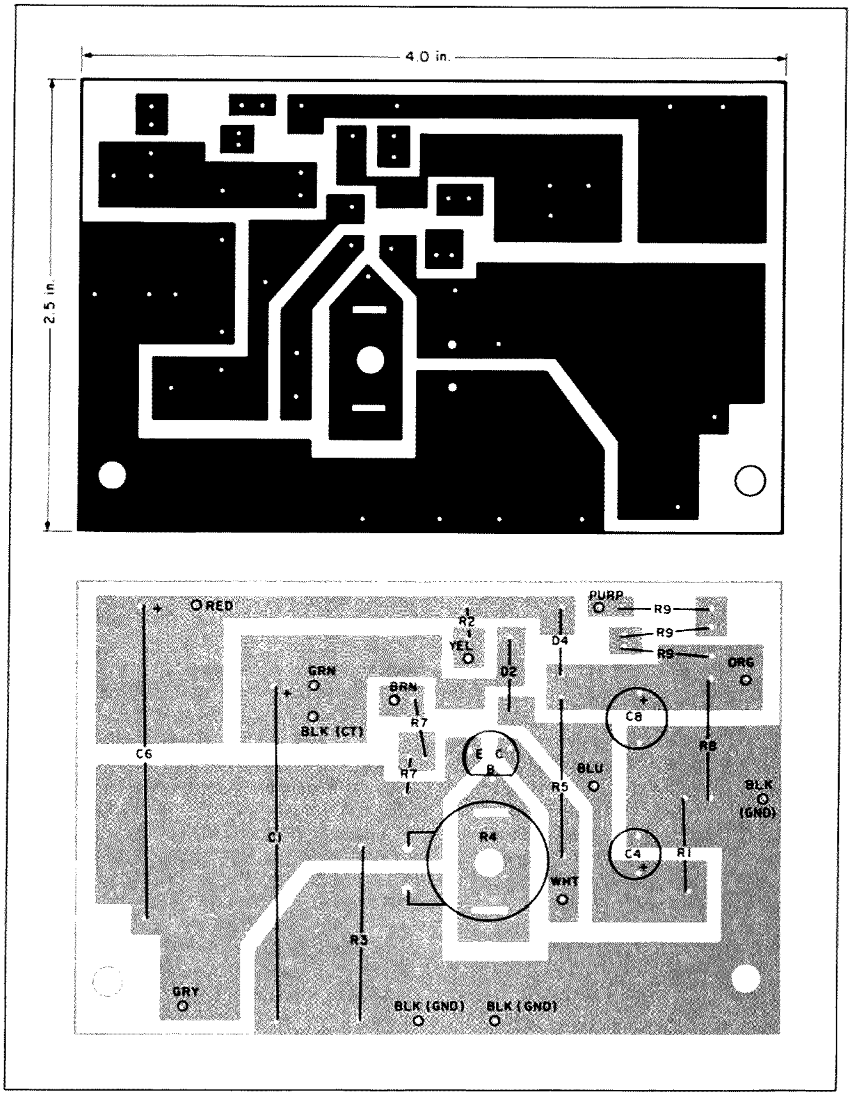

Figure 6. (a) Printed circuit board foil pattern; (b) Top side of board, showing component placement.

You must also use thermal grease when mounting the 5-volt regulator to the chassis. An insulator is not required, as the LM340-5 tab is intended to be grounded.

Mount the power-on LED in the small space above the meter. Because of the limited space, I glued the LED into a 5/32" hole drilled into the panel.

Conclusion

Since building this power supply, many of my project troubles have vanished. Having one supply for both fixed and variable voltages is extremely convenient, and the current-limiting feature has saved many projects. ■

The Dual Voltage Bench Supply

Quantity	Reference	Description
1	R1	470 ohm ½W resistor
1	R2	3.3K ¼W resistor
1	R3	1 ohm 10W resistor, RS 271-131
1	R4	1k pot, RS 271-227/333
1	R5	330 ohm ¼W resistor
1	R6	5k linear pot, RS 271-1714
1	R7	meter multiplier (see text)
1	R8	1k ½W resistor
1	R9	meter multiplier (see text)
2	C1,6	2200 µf 35V axial lead cap, RS 272-1020
5	C2,3,5,7,9	0.01 µf 50V disc cap, RS 272-131
1	C4	470 µf 16V radial lead, RS 272-957
1	C8	1000 µf 35V radial lead, RS 272-1032
1	D1	2–10A bridge rectifier, RS 276-1185
1	D2,4	IN4001 1A diode, RS 276-1101
1	L1	Red LED, RS 276-041
1	U1	LM340-5/7805 regulator, RS 276-1770
1	U2	LM317K regulator, RS 276-1778, ECG 956
1	M1	Panel meter (see text) RS 270-1754
1	F1	panel mount fuse holder, RS 270-364A
1	—	1½A fuse 3AG, RS 270-1283/1284
1	S1	SPST min switch, RS 275-624
1	S2	DPDT min switch, RS 275-626
3	—	5-way binding posts, RS 274-662
1	—	2 terminal barrier strip, RS 274-688
1	—	line cord, RS 278-1255
1	—	knob, RS 274-416
1	—	chassis, RS 270-253A
1	T1	power transformer 18V 2A, RS 273-1515
1	—	perfboard, RS 276-158

An etched and drilled PC board is available for $4.85 + $1.50 postage from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

73 Review *by Bill Brown WB8ELK*

The Signal Sentry

Miniature touch-tone decoder and message alert.

A & A Engineering
2521 W. La Palma, Unit K
Anaheim, CA 92801
Tel. (714) 952-2114
Price Class: $90 assembled, $70 kit

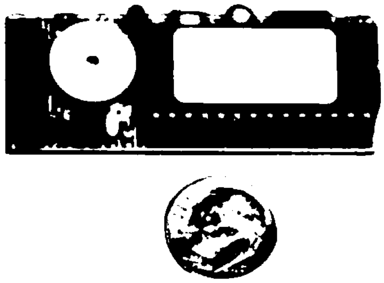

Photo A. The Signal Sentry.

The Signal Sentry is a microprocessor-controlled miniature touch-tone decoder. With a four-layer circuit board and compact layout, it measures just 2¼"L x 15/16"W x 7/16"H. It's small enough to fit inside of most 2 meter rigs and some larger HTs.

Why a Microprocessor?

The Signal Sentry is primarily used as a message alert system. It has a built-in LED and beeper that can be controlled via a touch-tone sequence. You can enter up to eight different alert notification numbers into its memory. With the Sentry hooked up to your rig, you don't have to listen to dozens of conversations while waiting for a call. All your friend has to do is send out your notification sequence on his touch-tone pad to alert you. Not only can the caller alert you of his presence, he can indicate the urgency of the call by pressing one of the letter keys on the pad at the end of the sequence. The urgency levels are D (informal level, 1 beep), C (important level, 2 beeps), B (urgent level, 3 beeps) and A (emergency level, 4 beeps repeated continuously).

The Sentry has a power-saver circuit that puts it to sleep after 30 seconds of inactivity on your monitored frequency. This reduces the current drain to an incredibly low 12 microamps. Whenever audio is detected, the Sentry is awakened via a MAXIM 666 audio detect IC. The average current drain during operation is still a very low 3 milliamps. Whenever the Sentry is awakened, it will tell you whether it has received an alert signal (and its priority level) via the LED or beeper.

One particularly nice feature is that a caller can also include a number ID at the end of the alert sequence. This requires some fairly long tone combinations by the sender. However, the ID number is sent out in Morse code by the LED or beeper whenever the Sentry is awakened. Not only can this circuit let you know that someone tried to contact you, it can also tell you who left the message!

The Manual

I recommend that you carefully read the manual several times. I found the whole thing incomprehensible the first time I read it. It took about three times through to finally figure out all of the features this circuit is capable of doing. I understand that the manual will be rewritten in the near future, however.

The section on readjusting the priority levels can be confusing. You can readjust the priority level to indicate messages with just an LED flash instead of the beeper. This requires hitting the reset button in the right sequence.

Also, programming in your ID numbers and other options requires you to have a "buddy" to send them over the air while you hold down the onboard switch. You can do this yourself if you have two rigs and THREE hands! Fortunately, you can add an external switch to one of the plugs on the circuit board and solve this problem (or you can just short out the switch during the programming sequence). Requiring you to hold down the switch was meant as a security feature so that others couldn't reprogram your Sentry over the air remotely. In fact there is an option sequence that allows you to program the Sentry without holding down the switch.

One problem may occur with owners of earlier model HTs. You need a 16-key touch-tone pad with the A–D key buttons to signal the Sentry! It would be nice to allow a shorter access code, particularly when using the Sentry as a radio remote controller. Presently this is not an option.

More Features

Although intended primarily for a message alert system, the Signal Sentry is also a very compact, lightweight touch-tone decoder that can be used to remotely control any piece of equipment. You do have to provide a transistor or logic interface to control external devices (See Figures 1 and 2). Two external devices can be separately controlled via the AUX1 and AUX2 output pins. To use the Sentry in this mode you must first configure it for continuous operation as its auxiliary outputs will reset when it goes to sleep mode. It still only draws 3 milliamps in continuous operation model I tested the unit out in this mode quite extensively to remotely control my ATV transmitter at my house while I drove around looking for hot reception sites. Even under marginal signal conditions, I could always bring up the transmitter. Although it would've been nice to control the rig with a shorter tone sequence, it does add a level of security.

One last feature to round out a powerful package: If you add a CMOS to RS-232 level converter IC, you can actually send serial data of all incoming touch-tones directly to a computer.

All in all, the Signal Sentry is one feature-packed device! You'd be hard pressed to find a more reasonably priced, compact, low power touch-tone decoder; not to mention one with a built-in microprocessor! ■

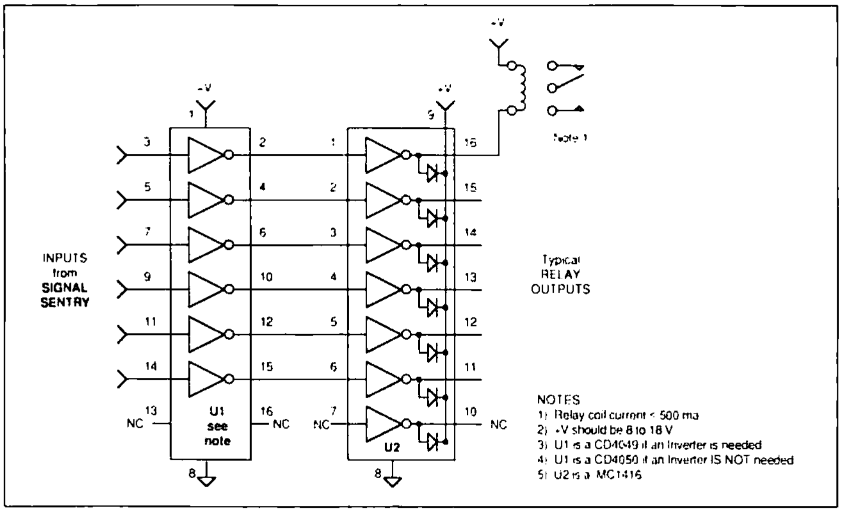

Figure 1. Interface for multiple output control.

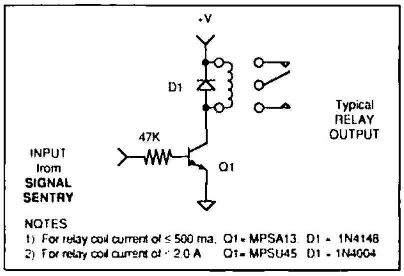

Figure 2. Interface for single output control.

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

Feedback# Title

1 Letters
2 Never Say Die
3 Dual Voltage Bench Supply
4 Review: The Signal Sentry
5 Ham Profiles
6 Review: The Yaesu FT-1000 Transceiver
7 The SPC Transmatch
8 Review: Antenna Quick-Launch System
9 ROBO-COPY
10 An Easy to Make 2 Meter Antenna
11 Solar Car Race
12 Review: Gap DX-VI Multiband Verticle
13 Service Survey Wrap-Up
14 ZED Loop Special
15 A Visual CW Offset Indicator
16 DX
17 Homing In
18 ATV
19 Hams with Class
20 Ask Kaboom
21 Looking West
22 Above 'n' Beyond 2 Meters
23 Above & Beyond
24 Barter 'n' Buy
25 New Products
26 Special Events
27 Ad Index 10/90
28 Keyword Index 10/90
29 73 International
30 Updates
31 Hamsats
32 RTTY Loop
33 DXDA Country List
34 QRX
35 Dealer Directory
36 Propagation
37 Random Output
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Number 5 on your Feedback card

HAM PROFILES

There are no "average" hams!

Now on the Air

Photo A. Stephanie Hassan KA3WMS stands near the Kenwood TS-140 she shares with her dad, Joe Hassan KA3RYY.

Stephanie Hassan KA3WMS of Sharon, Pennsylvania, passed her Novice exams last July. She and her dad, Joe Hassan KA3RYY—who, by the way, would like to express his thanks to Ed, their elmer—share the same station.

Besides her interest in amateur radio, 11-year-old Stephanie "collects cats," and would like to be a vet. She also collects stamps, and she enjoys bicycling and swimming.

Stephenie KA3WMS, a sixth-grader, is on the honor roll at school. In particular, she excels in math. *(TNX Joe KA3RYY.)*

Photo C. Reverend Gil Pries WA6RKD at his rig with some members of the Royal Rangers.

Inspirational Hamming

The Reverend Gil Pries WA6RKD of Los Angeles, blind since birth, taught himself to play the guitar and accordion before he was 10. In a recent article in the *Los Angeles Daily News*, WA6RKD was quoted as saying that his music ". . . was another way to communicate. When I play and sing, the music really seems to affect people." At 42, he is now a keyboard virtuoso as well, and he has produced an album of religious music.

In 1970, Gil WA6RKD graduated from Bethany College in Santa Cruz, California. Presently, Gil is minister at the First Assembly of God Church in Burbank, California.

One of Gil WA6RKD's greatest joys is the Royal Rangers. Sponsored by the Assemblies of God, Pentecostal, and other Christian churches, the Royal Rangers is a nationwide club for boys aged five to 17. Amateur radio, yet another way to communicate, is an activity Gil shares with the boys. *(TNX Bill Pasternak WA6ITF, with credit to the* Los Angeles Daily News *and the* Valley Good Guys ARC Gazette.*)*

Photo B. Michael Johnson N4YZW has a lot of fun with his HT.

Attention Getter

Michael Johnson's uncle, Andy Zorca WJ9J, challenged him to get his Technician Class license, promising him an HT if he did. For six months, eight-year-old Michael studied theory and code with his parents, Paul N4YGG and Althea N4YHY. Ten days after passing his Novice exams, he passed the Technician exams. He was very excited about getting his license in the mail so he could talk on his uncle's 440 repeater.

Michael N4YZW isn't shy about taking his HT anywhere and talking on it. Recently, in line at K-Mart with a friend, he talked to his father on the radio. His dad stated that he was several miles away, which elicited some curious stares. One child asked his mother, "Is that a real radio?"

On several occasions, someone has seen his radio at his side and asked, "Is that your walkie-talkie?" When he replies, "No, it's my HT," he gets bewildered looks.

Michael wants to upgrade to General soon, eventually getting his Extra Class. *(TNX Paul N4YGG of Hixson, Tennessee.)*

Prolific Teacher

Allen Wintersteen KL7IEI started a ham club at the high school in Bethel, Alaska, 12 years ago. Now he's in his second year of teaching radio fundamentals to students in the Kilbuck school.

This year's new crop of hams are: Joshua Morris WL7BWL; Ty Hulse WL7BWR; Muddassir Aliniazee WL7BWG; Denise Cambell WL7BWN, Julien Jacobs WL7BWF, Sara Elsworth WL7BWT, Kip Hulse WL7BWS, Sterling Graham WL7BWO, Brandon Power WL7BWQ, Yvonne Mockta WL7BWM, Jaclyn Mojin WL7BWX, Christy Helper WL7BWP, Danny Helper WL7BWP, Davy Helper WL7BWV, Edwin Hahn WL7BWI, and Robert Aloysius WL7BWH. Three adults also received their licenses: Carol Helper WL7BWJ, Greg Lee WL7BWK, and Cameron Cambell WL7BWU.

Bethel, a community of 4,000 people located in western Alaska, is accessible only by boat or airplane. At a time of great cultural change amid a severe winter climate, amateur radio activity enriches and helps stabilize the community.

The Anchorage Amateur Radio Club, and Roger Hansen KL7HFQ in particular, have helped keep the kids *on the air* with donations of radio equipment.

Photo D. Kilbuck School hams display their call letters with their teacher, Allen Wintersteen KL7IEI (far left).

73 Review

by Bill Clarke WA4BLC

The Yaesu FT-1000 Transceiver

A hot performer loaded with features.

Yaesu USA
17210 Edwards Road
Cerritos CA 90701
(213) 404-2700
Price Class: $3400

Photo A. The FT-1000 is a lot more complex looking than it is operating. Easy to use!

You've seen the photo ads in all the magazines and now it's here—the Yaesu FT-1000 transceiver. It's big, powerful, loaded with features, and expensive. The last point is relative, as everything seems expensive these days.

Among the top features of the FT-1000 are dual frequency reception, a full coverage receiver from 100 kHz to 30 MHz, 200 watts of output power, DDS (direct digital synthesis), and six microprocessors for operational control.

First Impressions

The FT-1000 looks impressive and its weight makes it even more so. It should be placed on a very solid operating desk or table, or its 51 pounds of weight will do terrible things. A good portion of the weight comes from the very hefty built-in power supply. After all, the transmitter is capable of 200 watts output.

A quick look at the operating manual assured me that there was little to fear in operating this new rig. It looks very complex, but the microprocessors do most of the work for you. For example: push-button selection of crystal filters, tuning speed choices, bands and VFOs, and direct keyboard frequency entry.

The FT-1000 also has 99 memories that may be scanned (each storing frequency, mode, filter selection, clarifier offset, and scan status). The automatic tuner section has an additional 39 memories for storing antenna settings for later recall.

The manual is laid out very well, is concise and easy to understand, contains considerable information about available options, and includes a basic system diagram. It is not meant to be a service manual or a primer on ham radio. However, to aid the new user in understanding the FT-1000's features, the manual is designed like a workbook and gives many hands-on examples to try while you're getting familiar with the unit. Still, I suspect that anyone very new to the hobby would be somewhat overwhelmed for the first few hours of use because of the terminology and features discussed in the text.

The manual has an excellent section on dealing with interference. It explains the operation of various controls (RF gain, AGC, noise blanker) and the proper use of the IF bandwidth, shift, and notch controls. It is good reading and unclouds the mystery of why some operators are bothered by QRM/QRN more than others. This information should really be published for the general amateur community because it applies to most modern transceivers.

I should point out that the manual is not perfect. Some illustrations are numbered and referenced incorrectly.

Operating

Of course, the first band I selected to operate on was 75 meters. Frequency selection was easy—just the push of a few buttons and the FT-1000 is ready to go to work. The first thing I noticed was the very quiet receiver (this review is being written in the thunderstorm season). It is nearly Ten-Tec quiet, and that is a real compliment! If nothing else justifies the price of this transceiver, the quietness of the receiver does.

On transmit I noticed the higher than normal output power. My peak reading meter indicated about 190 watts on LSB. A quick check-in with the gang indicated all was working, so I asked for critical reports. Nothing negative to report. In other words—it worked!

I then took my antenna tuner out of line and let the FT-1000's built-in tuner do the work. In seconds it had adjusted itself to my antenna, which is a full-sized horizontal loop cut for 75 meters. This is a nice feature, unless you are running an amplifier. Even in the latter case, with some older amps, there might be a need for it.

I spent the next several days operating on all bands and modes (except RTTY and packet). Comments I received from other hams were interesting and varied. All indicated excellent transmit audio and none indicated any problems with my signal.

The 1000 proved very easy to operate; most of the controls rarely needed touching after the initial settings. I wish that the rig had been equipped with the optional BPF-1 so I could experience real diversity reception and dual receive on mixed bands. However, the standard version as tested was a pleasure to use.

Receiver

The biggest attraction of the FT-1000 is the very quiet receiver. In a side-by-side comparison between the FT-1000, the ICOM IC-781, the ICOM IC-765, and the Kenwood TS-950, the FT-1000 came out the winner by a long shot. It also compares favorably with the ultra-quiet Ten-Tec Corsair II, which uses a different technology for frequency control and offers sparse features (few bells & whistles).

Having two VFOs is not new to most hams. The Yaesu FT-1000, however, goes an extra step and essentially provides two receivers. This allows dual frequency reception. Although not a new concept (Hallicrafters had it over twenty years ago), the Yaesu treatment is super. Unless the BPF-1 is installed , the two VFOs share the same antenna and bandpass filter. Without the optional BPF-1 you must operate both receivers on the same band, certainly a limitation if you are guarding a frequency on another band.

When receiving two frequencies at the same time, you can select a mix of the receive signals or a stereo effect, the latter with one frequency being heard in one ear and another in the other ear (assuming you are using stereo headphones). In either case you have control over the balance of the two signals.

By setting both VFOs on the same frequency, and then tuning one slightly, you will find the stereo reception quite useful for playing in the dirt, looking for weak signals, and for separating a desired signal from the trash. To aid in this quest you can se-

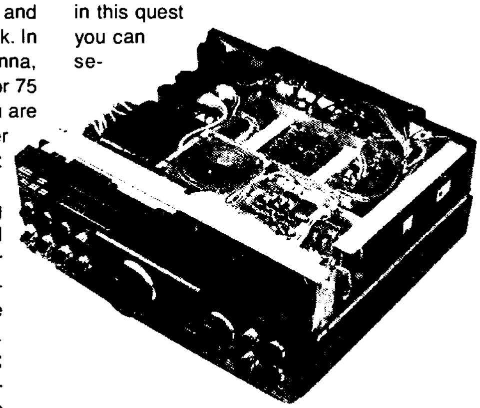


Photo B. Inside, the FT-1000 is stuffed with PCBs using surface-mount technology. Notice the large power transformer on the left.

Specifications*

(From the *FT-1000 Operating Manual*)

General

Receiving frequency range: 100 kHz–30 MHz

Transmitting frequency ranges:

160 meters:	1.5–2.0 MHz
80 meters:	3.5–4.0 MHz
40 meters:	7.0–7.5 MHz
30 meters:	10.0–10.5 MHz
20 meters:	14.0–14.5 MHz
17 meters:	18.0–18.5 MHz
15 meters:	21.0–21.5 MHz
12 meters:	24.5–25.0 MHz
10 meters:	28.0–29.7 MHz

Frequency accuracy: $< \pm 0.5$ ppm at room temperature

Frequency stability: $< \pm 2$ ppm from 0 to $+50°$ C
(except FM: $< \pm 200$ Hz)
(w/TCXO-1 option: $< \pm 0.5$ ppm from $-10°$ to $+60°$ C)
(except FM: $< \pm 150$ Hz from 0° to $+50°$ C)

Emission modes: LSB/USB (J3E), CW (A1A), FSM (J1D,J2D), AM (A3E), FM (F3E)

Basic frequency steps:
10 Hz for J3E, A1A and J1D
100 Hz for A3E, F3E and J2D

Antenna impedance: 16.5–150Ω (50Ω nominal)

Supply voltage: 100, 110, 117, 200, 220, or 234 VAC 50/60 Hz

Power consumption (approx.): 94 VA receive, 1050 VA for 200 watts transmit

Dimension (WHD): 420 x 150 x 375 mm

Weight (approx.): 25.5 kg (51 lbs.)

Transmitter

Power output: Adjustable up to 200 watts (50 watts AM carrier)

Duty cycle: 100% at 100 watts
50% at 200 watts (FM & RTTY, 3-minute tx)

Modulation types
SSB: Balanced, filtered carrier
AM: Low-level (early stage)
FM: Variable reactance
FSK: Audio frequency shift keying

Maximum FM deviation: ± 2.5 kHz

FSK shift frequencies: 170, 425, and 850 Hz

Packet shift frequencies: 200, 1000 Hz

Harmonic radiation: at least 50 dB below peak output

SSB carrier suppression: at least 40 dB below peak output

Undesired sideband suppression: at least 50 dB below peak output

Audio response (SSB): not more than -6 dB from 400 to 2600 Hz

3rd-order IMD: -36 dB at 150 watts PEP (-31 dB at 200 watts PEP, or better)

Microphone impedance: 500Ω to 600Ω

Receiver

Circuit type: quadruple conversion superheterodyne (triple conversion for FM)

Intermediate frequencies: 73.62 & 8.215 MHz and 455 & 100 kHz

Sensitivity: (w/preamp on, for 10 dB S/N, 0 dB micro = 1 micro volt)

	100–250 kHz	250–500 kHz	0.5–1.8 MHz	1.8-30 MHz
SSB,CW (2.4 kHz)	<1.25 µV	<1 µV	<2 µV	<0.25 µV
AM (6 kHz)	<10 µV	<8 µV	<16 µV	<1 µV
FM (29 MHz) 12 dB SINAD				<0.5 µV

Selectivity (-6/-60 dB):

Filter	Modes	Min -6 dB BW	Max -60 dB BW
2.4 kHz	all except FM	2.2 kHz	3.8 kHz
2.0 kHz	all except AM, FM	1.8 kHz	3.6 kHz
500 Hz	CW, RTTY, Packet	500 Hz	1.2 kHz
250 Hz	CW, RTTY	240 Hz	700 Hz
	AM (wide)	6 kHz	14 kHz

Dynamic Range (typical): 108 dB (at 50 kHz, 500 Hz BW, RF amp off)

Squelch sensitivity: 1.8–30 MHz (CW, SSB, AM): <2.0 µV
28–30 MHz (FM): <0.32 µV

IF rejection (1.8–30 MHz): 80 dB or better

Image rejection (1.8–30 MHz): 80 dB or better

Maximum audio power output: 2 watts into 4Ω with $<10\%$ THD

Audio output impedance: 4OΩ to 8Ω

*Specifications are subject to change, in the interest of technical improvement, without notice or obligation.

lect different filtering for each receiver (VFO), thus allowing a slightly different form of the signal on each receiver. Experiencing this on stereo headsets will make a believer out of you.

Of great interest to SWLs (shortwave listeners) is the capability of AM diversity reception. This is accomplished by placing one receiver in USB and the other in LSB, then tuning the same AM signal.

Antenna diversity reception can only be accomplished with the BPF-1 option installed. It allows the use of a separate antenna for each receiver. This aids in reducing multipath distortion of received signals, particularly when using two different types of antennas (i.e. vertical/horizontal).

What I Liked

1. The digital display is excellent and can be dimmed at the push of a button.
2. The frequency readout can be set up to display the 10 Hz digit (which I did).
3. Adjustable front feet, no pull down bail, to set the height and angle of the front panel.
4. The meter is large, well-lighted, and easily read.
5. Selectable attenuation is in S-unit steps (6 dB each).
6. The receiver's RF amp can be switched on/off.
7. Capability to monitor outgoing signal in SSB.
8. Two VFO knobs, one for each VFO.
9. Squelch operable in all modes.
10. Fast-tune button on the hand mike for up/down tuning.
11. Complete control over the internal keyer for weight and tone. You can even simulate a "bug" (semi-automatic key).
12. Selectable (by DIP switch) packet tone pairs and RTTY frequency shift.

What I Didn't Like

1. The tuning knob, although using increments of 10 Hz, seems too fast for me. I prefer a really slow turns/frequency ratio.
2. The noise blanker caused some distortion when strong signals were present on a close frequency.
3. I noticed a distinct dead spot in the receiver at 3.932.1 MHz (and a few other frequencies). I once noted a similar problem on the Kenwood TS-140 (at other frequencies). It creates no real problem, yet it is disconcerting when tuning across a band and hearing a momentary dead spot. I discussed this with Chip Margelli of Yaesu and he confirmed the existence of the unusual problem.
4. When entering a frequency via the keypad you must remember to insert a zero before the actual frequency for those below 10 MHz.
5. Having 99 memories is not to my personal liking. I cannot remember what is stored in each and prefer to use either the keypad or VFO for frequency control. I can see where they would be nice, however, for specialized uses such as RTTY or packet.
6. The cooling system only provides continuous duty at 50% power on RTTY. Full power output is limited to three minutes duration.

The Insides of the Rig

The FT-1000 is a new and different breed of transceiver. Yaesu, drawing upon its successes in the past with modular construction, has made this newest rig with a modular design, using many surface mount components. I see very little inside the transceiver that can be *considered* user-serviceable, but the *modular* design will probably make service easier for the technician and, therefore, less expensive for the owner.

The cooling system is novel, as it uses an internal squirrel cage fan instead of the usual computer-type bladed fan. It is very quiet!

Optional Features

The FT-1000 has a number of options available. The BPF-1 Band Pass Filter, TCXO-1 High Stability Master Reference Oscillator, and optional IF Crystal Filters are the most popular.

The BPF-1 allows the subreceiver to be tuned to any frequency, using a separate antenna. It has 11 receiver bandpass filters and a switchable attenuation network.

The TCXO-1 provides improved frequency stability (see the specifications list).

A maximum of five crystal filters may be installed in the 455 kHz 3rd IFs. They cascade with the eight factory-installed filters and are available in 2.4 kHz, 2.0 kHz, 500 Hz, and 250 Hz for the main receiver and 600 Hz for the subreceiver.

"If nothing else justifies the price of this transceiver, the quietness of the receiver does."

Other options include the CAT (RS232C level converter) and the DVS-2 Digital Voice System for recording received signals for instant replay or for canning outgoing messages, such as CQs.

Overall Marks

I have to rate the FT-1000 as a very fine piece of equipment and give the receiver extremely high marks for quiet operation. Additionally, having the dual frequency receive capabilities, rather than only two VFOs, aids immensely in reception capabilities.

As mentioned earlier, when comparing its receiver to those found in current equipment of like monetary value from other manufacturers, the FT-1000 beats all.

Is it worth the list price of $3399 (FT-1000D with all options lists at $4399)? I have to, when comparing it to other rigs on the market, say yes. I hope some of the new technology used on the FT-1000 will soon be applied to the lower-priced rigs, thereby becoming available to many more hams.

Thanks to those fine folks at EEB, 323 Mill Street NE, Vienna VA 22180 for the loan of an FT-1000 for this review.

The SPC Transmatch

Improved performance for 20 through 10 meters.

by L. B. Cebik W4RNL

With the abundance of reasonably priced commercial transmatches and an equally large number of articles on inexpensive home-brew units, there seems little that anyone could add to antenna tuner ideas. Little, that is, unless you use an all-band wire antenna. Then the limitations of commercial and general ham designs begin to show up. On 10 meters, one of the capacitors runs out of minimum capacitance a shade before the SWR drops to 1:1. The coil matches only as it hits the stop. Converting the 10:1 SWR to 50 ohms for the transmitter seems to exceed the unit's abilities, even though it performs well on every other band.

If you only wish to flatten a 2:1 or 3:1 SWR, you may never encounter these problems on any band. However, center-fed Zepp and variations on the G5RV antennas can present the transmatch with complex combinations of resistance and reactance. With enough reactance at the transmatch, normal all-band components and construction may provide a poor match at 10, 12 and 15 meters.

The problem is with the all-band design concept. My commercial transmatch covers 160 to 10 meters, with a 36 μH inductor and a pair of 240 pF air variables in a standard T circuit. This is all enclosed in a case allowing a half-inch space between the components and the chassis or case metal. Although the tuner is compact and versatile, the high-value components have high minimum values as well. The capacitors are rated at 40 pF minimum, which looks more like 45 or 50 pF with the case closed. Minimum inductance is not listed for the rotary inductor, but between 1 and 2 μH would be a good guess, especially with its 2½-inch external lead to ground.

Transmatch Performance

The standard T circuit (with series capacitors and a shunt coil) is a high-pass filter. It does little to suppress harmonic energy. The SPC circuit (as W1FB calls it), shown for comparison with the T in Figure 1, is claimed to provide an estimated 20 dB of harmonic suppression. Of course, we will only achieve the rated selectivity if we can maintain a high-loaded circuit Q. Normally, stray capacitance and inductance are low Q. Some designs use an additional fixed coil just for 10 meters, sacrificing variability for higher Q. In my commercial tuner, on 10 meters, most of the circuit capacitance and inductance come from stray sources in the wiring or the component construction. Just converting its design to the SPC circuit would not achieve much, but the conversion would lengthen the 14-inch long unit by another 10 inches by replacing the single-section capacitor with a split-stator version.

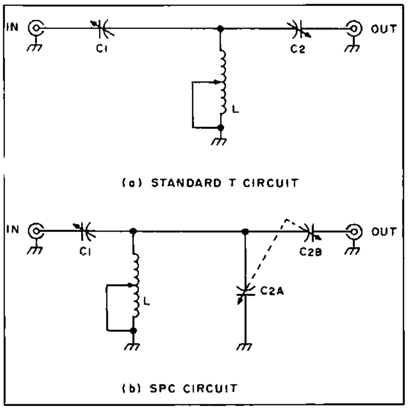


Figure 1. Comparison of T (1 a) and SPC (1 b) transmatch circuits.

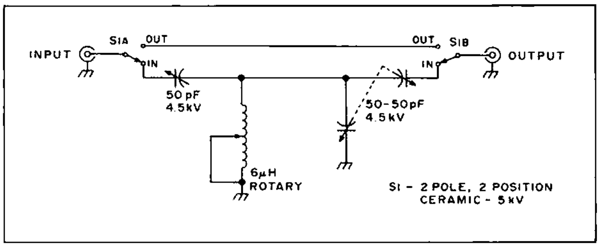


Figure 2. Schematic for the 20–10 meter SPC transmatch.

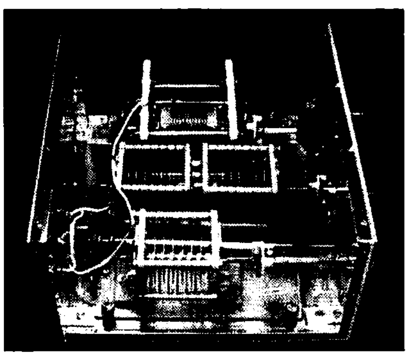


Photo A. Interior view of the 20–10 meter SPC transmatch.

Nonetheless, I consider my commercial unit a good tuner of its kind. To solve the problem of achieving high Q, high capability 10 meter matching, we may have to give up the idea of an all-band design. A 20-through-10 meter design to cover the "upper" HF bands offers a much better chance for nearly optimal performance. However, we can achieve that performance only if we remember all the hints various writers have given about component selection, layout, and materials. Since so many commercial and ham designs seem to have forgotten some of these tips, perhaps I should offer a few words about transmatches, even if only to jog the memory.

Component Values and Construction

The first step to achieving better 10-meter performance while not losing all versatility in the transmatch was to scale down components for assured coverage from 20 through 10 meters. 50 pF capacitors with a 5 μH coil would provide more than enough range for 20 meters. They would also maximize chances for low enough minimum values to perform well on 10. The SPC circuit requires one single-section capacitor, one split-stator capacitor, and a rotary inductor for infinite tuning choices.

Among the best transmatch capacitors on the new and surplus market are a series of Johnson (now produced by Cardwell) 4.5k volt units. For high-power use, I prefer these units with 0.125-inch plate spacing to units with 0.075-inch or 2-mm spacing. The

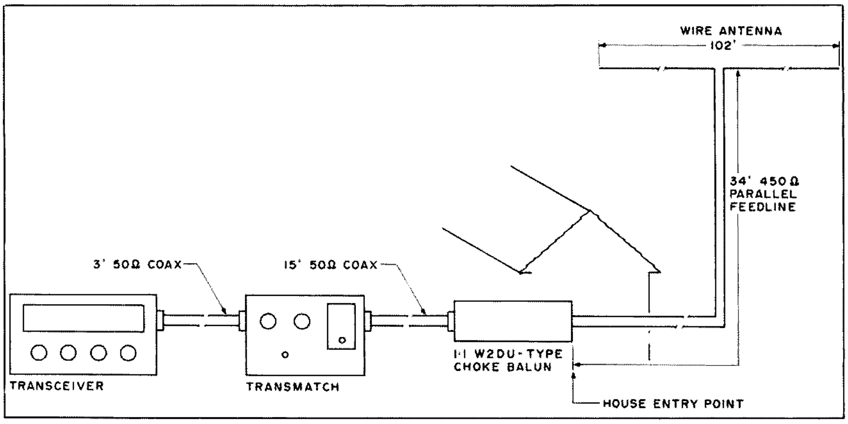


Figure 3. All-band wire antenna system used at W4RNL.

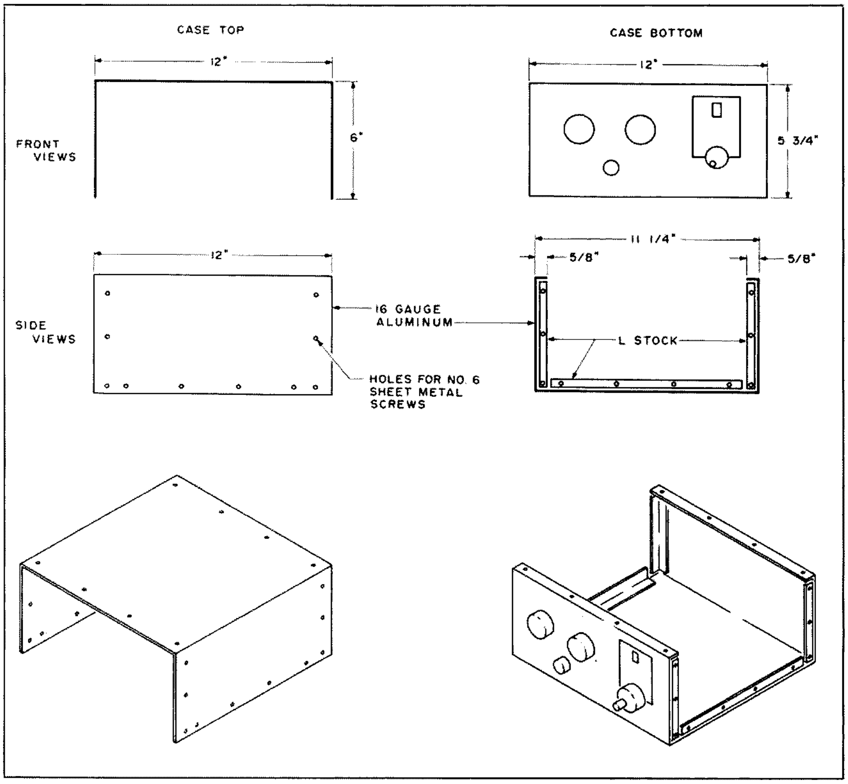


Figure 4. Simple 2-piece aluminum transmatch case.

present 154-12 unit is equivalent to the 1950s 50E45, while the 154-508 split-stator model is the old 50ED45. Both units have 52 to 53 pF as their maximum values and 10 to 11 pF as minimum values. Capacitance meter measurements confirmed the figures. New units cost above $35 and $60, respectively, but you may be able to find good quality units of either model at hamfests.

What gives these units their low minimum values is the use of trapezoid end plates presenting the least capacitance to stator plates. Until RF-rated acrylic end-plate units become generally available in a variety of values, the Johnson-Cardwell units are among the best high-power units around. A British firm (Nevada Communications) has introduced 250 pF, 2-mm plate spacing units that have minimum values of 13 pF per section. Millen 16000-series (e.g., the 16550 and 16100) capacitors (now distributed by Caywood) are also promising if you must purchase new units. These 6 kV, 0.171-inch air gap units will handle any amateur power. They cost slightly more than new Johnsons. Their minimum values are barely higher than the Johnson units. (At hamfests, be careful with old battleship capacitors, i.e. units heavily framed in metal. One of my 35 pF maximum units only goes down to 17 pF minimum. It may be useful for something, but not for this transmatch.)

For the rotary inductor, I had to settle for something a bit larger than 5 µH. The same Knoxville hamfest that provided the two needed capacitors (through the sharp eyes of my friend, KA4SAL, who got them for only $5 each) also produced an old military antenna tuner coil. It probably came from a TN-339 military tuner, which is similar to the BC-939. Fair Radio Sales has recently listed the 339 at $125 used and the coil at about $16. Measurements on the inductor with a grid dip meter yielded about 0.6 to 6.5 µH from one end to the other.

The inductor appears to be like the current B & W 3851, which lists new in the $80 range. Ceramics may have improved since WWII. The physical size of the end plates and

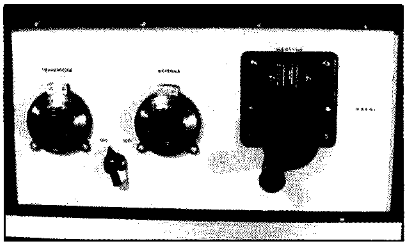


Photo B. Panel view of the transmatch at the W4RNL operating position.

braces is greater than planned, with outside dimensions of about 3" x 5" x 6". However, the range of the roughly 2" diameter, 2" long, 12-turn rotary inductor inside the frame is just about right. The #12 tinned copper wire is sized for high power.

The use of ceramic rather than metal end plates helps to reduce stray capacitance between coil turns and ground. In fact, none of the metal bars between end plates will be grounded. Every source of stray capacitance will be minimized. As with capacitors, RF-rated acrylic-supported rotary inductors are beginning to appear. Again, Nevada has introduced a 30 µH coil with a minimum inductance of about 1 µH. Properly designed, only these types of units will surpass the ceramic unit in minimum inductance value and in potential circuit strays. For the $5 price, the surplus ceramic inductor is quite adequate.

Transmatch Construction

To minimize stray inductance and capacitance, the transmatch uses the simplest possible design. (See Figure 2.) It contains no SWR circuit, since there is already one in the line. The one concession to convenience is an "in-out" switch, a ceramic unit capable of handling fairly high power. Having a ham dad (W1BUK) with a good junk box helped here.

The circuit also contains no balun transformer. My particular antenna system makes one unnecessary, as Figure 3 demonstrates. The 102-foot antenna uses 34 feet of 450 ohm parallel feeder to reach the side of the house. However, that is about 15 feet from the equipment. Using a home-brew version of the W2DU choke-style balun (not a transformer), I convert directly to coaxial cable at the house entry. Radio Works sells a choke balun of similar design. My calculations suggest that, at the highest SWR levels, I can lose no more than 1 dB of pow-

Parts List

1	50-50 pF dual section, 4.5 kV air variable capacitor (Johnson 154-508 or equivalent)
1	50 pF, 4.5 kV air variable capacitor (Johnson 154-12 or equivalent)
1	5 to 6 µH rotary inductor (B&W 3851 or equivalent)
1	2-pole, 2-position, 5 kV ceramic rotary switch
1	Turns counting dial for inductor (B&W 3902 "Cyclometer" or equivalent)
2	6:1 vernier dials for capacitors
3	Insulated flexible couplings for capacitors and inductor
4	Insulated shaft extensions for capacitors, inductor, and switch
1	Through-panel shaft for switch
1	Switch knob
2	SO-238 panel mounted coax receptacles
1	11" x 12" x 5¾" case or materials for case
	Miscellaneous paint, lettering, hardware

Suppliers of Transmatch Parts

Barker and Williamson, 10 Canal Street, Bristol PA 19007 (Inductors, turns counters.)

Caywood Electronics, Inc., P.O. Drawer U, Maiden MA 02148-0921 (Millen capacitors and other components.)

Fair Radio Sales, P.O. Box 1105, 1016 E. Euraka Street, Lima OH 45802 (Surplus parts and equipment.)

Kilo-Tec, Box 1001, Oak View CA 93022 (Nevada acrylic-supported variable capacitors and inductors, B & W components, and antenna supplies.)

Nevada Communications, Telecomms, 189 London Road, North End, Portsmouth, Hants., PO2 9AE, United Kingdom (Acrylic-supported variable capacitors and inductors.)

Radiokit, P.O. Box 973, Pelham NH 03076 (Variable capacitors, inductors, dials, turns counters, insulators, switches, etc.)

Radio Works, Box 6159, Portsmouth VA 23703 (Baluns, antennas, feedline.)

cr at 10 meters. However, I gain freedom from all the unbalancing effects of metal conduit and other house fixtures. Hence, I do not radiate indoors. The system works well for me, however controversial the ideas behind it.

The photograph shows the essential elements of transmatch construction. The capacitors and the inductor mount on an acrylic plate. Within the limits of component size, wiring is as short and direct as possible. The front-panel end of the inductor, the same end of the coil-contact bar, and the grounded stator section connect together with short leads of #14 silver-plated Teflon™-insulated wire from an old project. The ground terminal is actually a threaded metal spacer the same length as the base plate corner supports (one inch). The rear inductor contact bar terminal also goes to a spacer. The cabinet provides the ground points. Use a lock washer with the machine screws to ensure good screw-to-case contacts.

Everything, including the switch, mounts on the base plate. Scrap acrylic provides blocks for the capacitors and a mounting plate for the switch. Ultimately, only the four corner-mounting bolts and the two ground spacer-lugs will make contact with the cabinet.

The acrylic base plate is about 11" x 7". Insulated shaft couplings and shaft extensions, plus the switch at the rear of the plate, enlarge the space requirements. Therefore, the unit requires a cabinet about 12" wide, 5¾" high, and 11¼" inches front-to-back. Figure 4 shows an idealized cabinet made from two 12" x 24" pieces of 16-gauge aluminum. The result is a shadow cabinet with a wide front lip and a quarter-inch side overlap.

More important than appearance is the fact that the cabinet provides at least one inch or more of clearance in every direction from the transmatch components. As noted, my commercial unit uses only about a half-inch of clearance, but requires extensive readjustment on the upper HF bands between open and closed cabinet use. Additional clearance makes the home-brew panel larger than the commercial one, but that is not much of a price to pay for lower strays.

Since I did not have access to the ideal 16-gauge aluminum, I used thinner utility aluminum from a home improvement center. Again, the photograph of the interior shows the additional material used to strengthen the sheet stock. L-stock, ½" x ½" x 1/16" thick, forms a ring around the front and rear panels, which have an extra 5¾" x 12" sheet to strengthen the panels. The bottom of the cabinet has 1" wide by 1/16" thick strips running from front to back. They carry the cabinet feet and the corner-mounting bolts from the base plate. Four short strips of ⅛" thick strap lock the feet and longer strap to the L-stock at the front panel. More L-stock along the sides of the cabinet bottom provides a place for sheet-metal screws to hold the top.

The front panel capacitor knobs are Japanese verniers available from several sources. (Verniers are necessary with the sharp tuning of the SPC design.) The inductor turns counter costs nearly $60 new or about $25 at some hamfests. To save me money, W1BUK came to the rescue again. Dismantling an old beat-up counter from his junk box allowed me to clean the counter face and the hardware, paint the bezel, clean and grease the gears, and replace the metal shaft with a plastic one. A large combination crank-knob finished the rejuvenation. The switch required only a panel through-shaft and an insulated extension to the switch shaft itself.

The rear panel has only two coax receptacles. Each is mounted to provide a short lead to the switch. After fitting and drilling and trial mounting all components, disassemble everything for painting. Several thin coats of spray paint, a little rub-on lettering, and several thin coats of clear acrylic complete the job. Before painting, place small pieces of tape over the two bottom holes for the screws that connect the base-plate ground point spacers to the case. The unpainted aluminum will provide a surer ground contact.

The Results

The results were everything I had hoped for. A serious test engineer would caution that, without extensive laboratory tests, we cannot specify precisely the effect of each effort to improve performance. However, the combination works. Striving for the lowest component minimum values, reducing wiring strays, and reducing cabinet strays produces a transmatch that has spare capability at 10 meters.

Although we cannot directly compare an SPC design with a standard T design, the new unit has more than a half-turn of coil and 15 percent of capacitor left in the "worst" case at the top of 10 meters. Settings for other bands fall into just about predictable positions. The amount of required readjustment between lid-on and lid-off operation is insignificant. The band-pass characteristic of the design shows up in the ability to make initial settings by listening to receiver noise. Only minor peaking is necessary to null the SWR. All settings are repeatable. In short, the transmatch does everything I asked of it.

And a bit more. As an added bonus, the unit matches my wire antenna on both 30 and 40 meters, as well as on the higher bands. Because the SPC design provides greater harmonic reduction than the standard T design, the commercial unit is now labeled for 80 and 160 meters only.

The lesson is that "all-band" is not always best. Designing a transmatch with 10 meters in mind, and sacrificing the lowest bands, resulted in superior performance where I needed it. Even new, the capacitors and coil would cost less than the 240 pF and 36 µH units used in low-band tuners. Of course, only luck, family, and friends kept the total cost of this project well under $50. But with a little patience, you can be that lucky, too. ■

You may contact L.B. Cebik W4RNL at 2414 Fair Dr., Knoxville TN 37918.

Antennas West
Box 50062-S
Provo UT 84605
Tel. (800) 926-7373
Price Class: $30

73 Review

by Jim Gray W1XU

Antenna Quick-Launch System

All you need is a strong arm and the QL system.

Photo. Nuge WB8GLQ launches the support line for a new 75 meter dipole into a nearby tree. Note, however, that the proper technique requires placing the bucket on the ground in front of you and throwing the weight underhanded.

Round, Yellow, and Fuzzy...?

OK guys and gals, time for a quiz: What's spherical, the size of a tennis ball, bright yellow, fuzzy all over, and weighs a pound? Give up? I don't blame you, as I wouldn't have guessed it either—not until I saw it, and maybe not even then. When you see it, you still can't imagine what it's for!

The answer is the QL Quick-Launch system from Antennas West. Jim Stevens, proprietor of Antennas West, has been a wire antenna enthusiast for more years than many hams have been alive, and he's tried them all. Early in the game, he decided that one clue to a good antenna was height, but the first trick was getting tall supports, and the second trick was placing the antenna near the top of the supports.

Wire Antenna Erection Methods

We've all tried the bow-and-arrow method, haven't we? And the slingshot system, the strong-arm technique (ouch!), and even the old line-around-the-pliers ploy (my favorite). Each has its advantages and disadvantages, mostly the latter. "So what's the point?" you ask. Simply this: After about five years of experimenting with materials and techniques, Jim Stevens has come up with what I consider to be THE solution to wire antenna erection tasks. He has designed a system for putting up your wire antenna at a useful height, especially if you have tall trees for support.

Contents of the System

The system is simple, inexpensive, and (almost) foolproof. It consists of the projectile, the leader line, the support line, and the bucket.

The projectile is a one-third pound spherical weight about the size of a golf ball with a fishing swivel attachment embedded in it. It's a bright red-orange fluorescent color for easy visibility even in poor light. A yellow fluorescent tennis ball with a slit in its surface admits the projectile. The twist-proof, neat length of nylon leader line, especially woven to prevent snarling and snagging, is also a fluorescent yellow—all 150 feet or so of it. Finally, 200 feet of camouflage Dacron™ invisible to the causal passerby. Prefabricated to last as long as you'll need it, it's also strong and tangle-proof. Dacron is also darned near stretch-proof, too. The last component of the QL system, the bucket, is about the size of a gallon paint can with tapering sides, squeeze-on lid, and bail, or handle. Everything I've mentioned so far fits inside the bucket, except for the antenna and the tall supporting trees. And there's room for extra line and projectiles.

To Use, Borrow an Arm

How do you use this contraption? Thought you'd never ask. Let's say you've picked your supporting objects, and now you're looking at the tennis ball and weight...and line. Unless you're clearly out of the way of houses, people, animals, and other impediments, maybe you'd better leave the projectile-weight inside its protective tennis ball cover, otherwise significant damage might result to innocent bystanders. On the other hand, if you're alone and out in the clear, leave the cover off the weight. The golf-ball sized weight does a really neat job of dropping down through branches and twigs and leaves without the cover.

Today I wanted to put up my new loop antenna for 30 meters and support it between two 45-foot Ponderosa pines in the side lot. I set up the paraphernalia in the yard, in the clear, and the recommended distance away from the trunk of the tree. Jim Stevens has this all figured out for you, and in his instruction manual, he describes in detail the best technique for using his system.

The idea is to throw the weighed leader-line over the supports, preferably one at a time, unless you are Tarzan. The throwing arm of a man in his late 50s and early 60s is not the equivalent of the arm of even a small teenage boy, and certainly not comparable to the arm of a young athlete. My son, a vigorous thirty years of age, happened to be home, and he "volunteered" for the job of projectile launcher. I was the "launch meister." On the first try, he put the weight, line, and bucket (tied to the line for safety) over the blooming tree! The next time, the apparatus sailed over the exact top of the tree, dead center. The weight dropped neatly through the branches, carrying the bright yellow line with it. Voila! Perfect performance.

Thus, in a matter of less than fifteen minutes, the job was accomplished. No strain, no pain, and exactly where I wanted it. I pulled up the heavier support line with plenty of spare, but I hated to cut that beautiful stuff so I coiled the unused part neatly and hung it from the tree trunk.

Simple and Elegant

To sum up, you tie one end of the leader-line to the bucket's bail (or handle), gently drop the line into the bucket, allowing it to settle (beware: do not try to coil it) loop upon loop, until it's all in the bucket, leaving the projectile outside. Then you place the bucket on the ground in front of you, making sure there are no bushes or entanglements to trap the line when you throw the weight.

The line comes flying out of the bucket as neatly as you please, with nary a snarl or backlash. Jim Stevens tried a lot of line materials and sizes before he got one that wouldn't loop, snag, or snarl itself. Remember the old harpooner whose leg was caught in the line and he was dragged under by a whale? Keep that line in the bucket until you're ready to throw it, and keep all possible snags clear of it when you set it up.

The Quick-Launch antenna-raising system really works! How well, you'll have to try it for yourself to believe it. No more bow-and-arrow, agile Nimrod, or freckle-faced slingshot artist to tell on you—just the Antennas West QL system, and one more thing: a good throwing arm!

The basic kit sells for $30 and includes reusable (if you don't lose them) fluorescent projectiles, "twilight-view" launch line, safety cover (tennis ball), a 200-foot spool of double Dacron twist-proof support line, the bucket, and a detailed instruction manual. There is a 51-foot system for 80–10 meters and a 102-foot system for 160–10 meters.

Should you need them, Jim will sell you extra line, weights, and probably even tennis balls for a small price. But frankly, the original stuff ought to last several seasons, and I doubt you'd need replacements, unless you forget to carefully store the system when finished, and some needy soul comes by and makes off with your treasure. I keep mine under lock and key, just in case! 73

Jim Gray W1XU, 210 Chateau Circle, Payson, Arizona 85541, has been 73's propagation columnist since 1984. He's been a ham for 40 years, and likes to operate CW on WARC bands 12, 17, and 30. He's also interested in aviation and photography.

ROBO-COPY

Automate your shack with a CW copier.

by Michael Hansen WB9DYI

As an avid CW operator, I have often heard 50+ wpm (words per minute) QSOs and wanted a low-cost way to see what automated CW was about. Many of the Morse code receive programs on the market don't work on DOS PCs, and I wanted a fully featured software package that runs on an IBM or clone.

This inspired me to write a program I call ROBO-COPY. It's an easy-to-use program which, with the addition of a simple interface circuit, allows you to use your IBM or compatible to copy CW right from the speaker or low impedance headphone outputs of your rig. The software was designed to run on anything from a bare bones PC up. The minimum requirements are at least 256K memory, CGA video adapter, and a floppy drive. The hardware interface to the PC is through the COM1 port.

I designed this program to be flexible because every CW operator has a different style. With a few single keystrokes, you can change copy parameters to match virtually any op's unique character and word timing. Another feature resets these timings to nominal values, again with a single keystroke. Critical mark and space timing parameters are adjusted automatically by a statistical algorithm that copies any speed CW up to 120 words per minute.

Care has been taken in the design of this software to ensure compatibility with a broad spectrum of DOS machines, both IBM and clones. All manipulations of the hardware are done via the standard BIOS calls. The COM port's baud rate clock measures incoming signals, so you don't need CPU clock speed dependent timing loops on machines that don't have an on-board real-time clock with millisecond resolution (e.g., PC class machines).

To reduce the effects of noise, a sampling filter has been built into the software. This filter "qualifies" a transition from a mark (dit or dah) to a space (no signal) or vice versa "by over sampling" the transition. In order for a transition to be recognized by the filter, the signal must be free of any glitches for a period of 16 (LOW setting), 32 (MED setting) or 64 (HI setting) continuous samples. Like the timing settings, you can change the filter parameter with a single keystroke. With a good quality receiver (I use a Kenwood TS-520) and a little practice, you can copy signals as weak as S4 or S5 with good readability.

All of the Morse English characters listed in the ARRL Handbook are supported. This character set includes *A-Z 0-9/=();:$- " ',.* The command character set is also complete per the handbook: *SK, SN, AL, AS, AR, BT, HH, IQ* and *KA*. These two-letter commands are displayed in reverse video for easy recognition.

In addition to the above set of characters, two characters are used that are not part of the ARRL standard Morse set. These two characters annotate internal errors. An * means that an undefined code was received. For example, ---- (four dahs). A # means that a character "overran" the maximum length for a single Morse character; that is, a character with more than eight marks (dits or dahs).

Three Special Features

A handy feature for retaining important QSO data, such as callsigns, names, and signal reports, is the scratch pad, located in the bottom four lines of the screen. You can turn the scratch pad on and off by pressing the space bar to capture data. When the scratch pad is on, the data received will be displayed in both the copy and scratch pad area. When the scratch pad is turned off, the incoming CW will only be displayed in the copy area and a | will denote where the scratch pad copy was terminated.

Like all user-friendly software, HELP is available online. Simply press the letter *H* to access these screens and they will display information on setting, clearing, and restoring copy parameters. You can also find tips on receiver operation in the HELP section.

The Mode command turns ROBO-COPY into a CW Elmer. When you select Normal Mode, the incoming character is displayed immediately after it is received. The Teach Mode delays the last character received until immediately before the next character. At speeds of 3–10 wpm, this feature prompts the student to hear, think, and then see the incoming character. Since you can connect the interface to any speaker or low-impedance audio output, you can practice in the Teach Mode with a receiver and on-the-air signal, like W1AW, or with a tape from a tape player.

Audio Interface

The interface circuit couldn't be much simpler (see Figure 1). T1 is a small, common power transformer which isolates the computer from the transceiver. I used a power transformer instead of an audio transformer because power transformers offer higher isolation voltage capabilities. Most power transformers can withstand a 2,000 volt difference between the primary and secondary windings. The typical transistor audio transformer, while exhibiting a much greater frequency range, can only withstand about 250 volts. This margin of safety could save your equipment and disk data (maybe even your life) by keeping RF, static discharges and ground faults from entering your PC or rig via the interface.

Besides isolating the two systems, T1 steps up the speaker or headphone output voltage from a nominal 0.3V p-p across an 8 ohm load to about 3V into the base of the PNP Darlington transistor pair. The 12V secondary of T1 looks like about a 300 ohm load to your speaker or low-impedance headphone output. This allows you to keep the interface in parallel with your audio output and monitor the signal through your speaker. You could also drive a small monitor speaker included in the interface circuit, as shown in Figure 1.

The Darlington configuration is not used so much for its high current gain as for its 1.4V Vbe clipping action that eliminates low-level background noise. When the input signal to the transistor is less than this threshold, no current is drawn by the transistors; once the threshold is exceeded, the transistors use their combined high current gain to amplify and rectify the incoming audio. The time constants of the 470 ohm resistor and 4.7 µF capacitor are used to filter the rectified audio supplied through the indicator LED from the collectors of the Darlington pair.

The resulting rectified and filtered audio is fed directly into the RI (Ring Indicator) pin of the PC's COM1 port. The signal supplied by the interface isn't the sharp-edged digital signal you might expect a computer to require. Rather, the signal at the RI pin has artifacts of the audio signal from which it is derived. The RS-232 receiver inside the COM1 port has excellent switching characteristics and does a good job of cleaning up the signal for the PC.

In order to prevent RFI from the PC from entering your receiver via the interface, capacitors C4 and C5 should be installed right in the female COM port connector. Make sure that the capacitor leads have some "spaghetti" nonconductive tubing to prevent internal shorts in the connector. You can gain additional RFI attenuation by using a large ferrite toroid core as an RF choke on the interface cable. Simply thread the cable

through the toroid as many times as possible. The toroid should be positioned as close to the PC end of the cable as practical.

Raw Speed versus Sophistication

You can automate the process of copying CW at several different levels. To gain a perspective of this task, let's look at the inventory of skills various levels of CW operators possess.

Experienced CW operators are often regular members of CW traffic nets. Able to copy more than 35 wpm for sustained periods, they copy complete words and sometimes entire phrases. They can copy signals imperceptible to the untrained ear, even through moderate QRM and QRN. Almost as important as their ability to copy the information is their ability to reconstruct what was lost in the process of communication. Because they have trained their minds to semi-consciously copy code through aural pattern recognition, their conscious minds are free to make judgments on the content of the message being received. It's this type of higher level language function that let us make sense of the following sentence: *You c n stil re d this sent nce ev n hough it s miss g lett rs.*

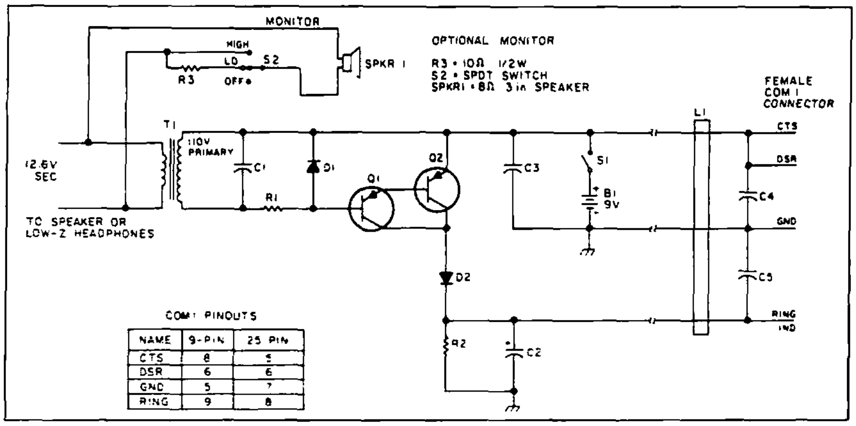
A cybernetic version of the CW expert is theoretically possible with today's leading edge digital signal processing and artificial intelligence technology. Considerable research is being expended on these types of systems, particularly in the area of direct voice interface to computers. As you might expect, personal computers will have to take yet another quantum leap in technology before they will have the resources to match this challenge.

Short of having a large research budget and the latest in processor hardware, we can still write a very effective CW code copier program for the PC. ROBO-COPY's practical approach mimics the method employed by beginners. Instead of recognizing patterns in the incoming CW, this method sorts the signal into dits and dahs. Information on when a character or word has been completed is derived solely from the amount of time between message elements.

For humans, using this primitive approach limits our copy speed to not much more than 5-7 wpm. Beyond that, the conscious mind is not effective in measuring and assembling finite events. While the computer is hopelessly outclassed in virtually every other comparison with the human brain, it has no biological equal when it comes to making very simple decisions very fast. This means that a computer programmed to copy CW a dit at a time is an entirely workable system...no problems with speed, frustration or distractions.

Using ROBO-COPY

A typical session begins with the operator logging his machine onto the drive and directory where ROBO-COPY is stored. Simply enter ROBO, then press ENTER or RETURN. A few seconds later the main screen should be displayed. Check to make sure that the interface is turned on and is connected to COM1.



NAME	9-PIN	25 PIN
CTS	8	5
DSR	6	6
GND	5	7
RING	9	8

Figure 1. The ROBO-COPY interface.

The receiver should be in CW Mode, with the CW filter IN and the AGC control in the FAST position. Try tuning in a Q5 CW station, then reduce the RF gain to the MINIMUM needed to maintain solid copy. Increase the audio gain until the interface indicator LED blinks distinctly in sync with the audio. (RTTY sounds somewhat like high speed CW, but its coding and modulation schemes are different. ROBO-COPY does not copy any mode other than Morse CW.)

The screen should now be displaying the incoming code. For very fast or very slow code, one or two wrong characters may be displayed while changing its internal copy parameters.

One of the most common modifications to the nominal reception parameters is to change the letter timing. Although the recommended space between letters is three dits long, hams frequently shorten this time to as little as one and one-half dits long. The program boots up with the letter timing set at 1.7 dits, which gives the 3-dit spacing adequate margin. Some contesters and hams trying to sound fast tend to rush their timing and thus run their letters together. This practice is so common that I thought, despite comprehensive diagnostics, that there was a bug in the software. However, after a nearly perfect copy session with W1AW, it was proven that the timing was accurate.

The following sentence is an example of copy with short inter-character timing: "NAME 5 *C* ##" (It should read: "NAME IS RICK. QTH").

The telltale signs here are the presence of the error characters # (overrun) and * (invalid character). The overrun occurs when a few shorter letters combine into one letter over eight marks long. This concatenation of shorter letters can also result in invalid character combinations as well. Sometimes a number will be displayed when two letters falsely combine. For example, when the spacing between letters is too short, the word "is" (.. ...) can be mistaken for the number "5" (.....).

To adjust for this shortened timing, simply press the letter *L* (all commands can be either upper or lower case) and then press the "-" (minus or hyphen) key. The letter timing will decrease by 0.1 dit each time the "-" key is pressed. Once the correct timing has been achieved, the copy will become more readable.

If Letter timing is too short, letters will decompose into E's and T's corresponding to dits and dahs. The phrase SOS will appear as EEETTTEEE. Lengthen Letter timing by pressing *L* followed by the appropriate number of "+" (plus) key entries.

Misadjustment in the Word timing is more obvious. When *lettersruntogetherlikethis*, simply decrease word timing by pressing *W* followed by a "-" (minus or hyphen key). Word timing decreases by 0.5 dits for each time the "-" key is pressed.

If there *a r e t o o m a n y s p a c e s* between letters, increase Word timing by first selecting *W* followed by "+" (plus key) entries.

Just as you can change the Letter and Word timing to suit the timing of an individual's style, you can modify the Filter for different noise levels. The normal setting for the Filter is MEDium. This setting offers the best noise immunity without compromising speed. The LOW setting is best for high speed code re-

continued on p. 51

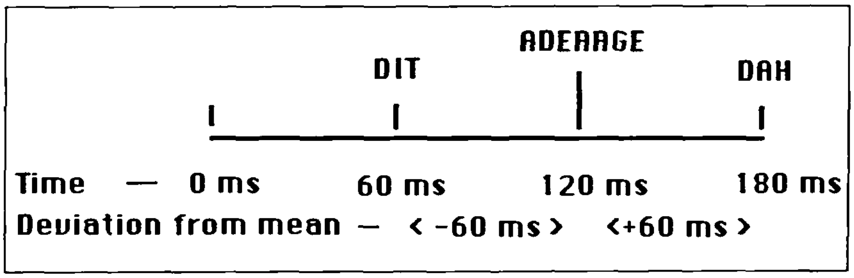


Figure 2. ROBO-COPY uses the deviation from an average value to distinguish between dits and dahs.

An Easy to Make 2 Meter Antenna

Make a strong J-Pole from an old TV antenna.

by Art Williams AA5KB

My new 2 meter rig, just purchased at a swap meet, needed an antenna. I wanted something that I could put on top of the 30-foot mast that supports my inverted vee's. I first considered a ground plane with a $\frac{5}{8}\lambda$ whip, but then I came across an old TV antenna with a folded driven element. I immediately saw a J-pole, already made except for cutting out and mounting!

The J-Pole

This version of a J-Pole antenna *will* withstand wind and weather. And, since the J-Pole does not require a ground plane, it's easy to make.

The design criteria is taken directly from the *ARRL Antenna Book, 14th Edition*. The antenna itself is literally a junk box design. I did not have to buy anything to build it—it is made from an old TV antenna having a folded driven element. (See Figure 1.) The metal is $\frac{3}{8}$-inch aluminum tubing and since the driven element is folded, the loop part of the "J" is already formed. *[Ed. Note: If an old TV antenna is unavailable, you can purchase an inexpensive FM antenna with appropriate folded elements from Radio Shack—part# 15-1639. Although it will be much heavier, the "J" can also be made from a length of 3/8" copper tubing available from most hardware or building supply stores. Bend the tubing around a 2" pipe to form the "J" loop.]* Measure 19 inches from the loop towards the insulator and cut the tubing with a hacksaw. The long side should be 57 inches (3 x 19). You will likely find that you do not have 57 inches on that side. You must cut the tubing close to the other loop but in the straight portion of the metal. Cut a piece from some other element and splice the longer piece to make up 57 inches. There are some square sections coupling the straight elements to the main mast section and these can be used to couple the sections together. In my antenna, I welded the extension on to give a smoother appearance. You could also lap the extension over the main section and clamp them together with a small stainless hose clamp. Doing it this way allows you to experiment with the length of the main element.

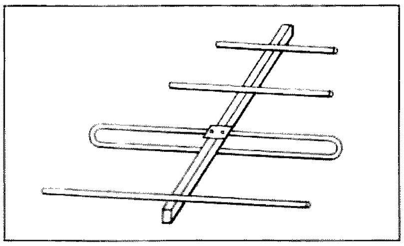


Figure 1. Use an old TV antenna with a folded driven element.

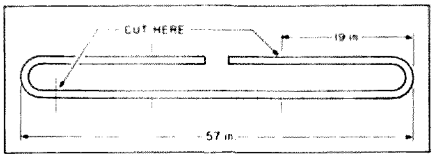


Figure 2. Tubing dimensions.

The next step is to make the mount. You need only a piece of PVC water pipe. I used a piece of $\frac{3}{4}$-inch 200 PSI pipe with a matching "T", but you could use schedule 40 or the gray electrical type. Some building supply stores sell PVC in two-foot lengths, which should be more than enough for the mount. I used an eight-inch piece for my horizontal mounting block. I began by drilling two $\frac{3}{8}$-inch holes through the tube, the first about one inch from an end, and the second exactly two inches from the first, measured center-to-center. Yours could be slightly different depending on the separation of the short and long legs of the "J." You are going to slip the PVC tube over the two stubs, so the holes need to be exactly the same distance apart as the center of the stubs. Of course, the two $\frac{3}{8}$-inch holes must be in line. A drill press is very handy for doing this but you can manage with a hand drill if you are careful.

Now slip the PVC tube over the long leg first and work it down to where you can slip the short leg through the other hole. It makes no difference which hole you start with. If you want the long leg toward the center of your mast, put it through the hole farthest from the end. This, of course, means that the short leg will come up through the hole closest to the end. Push the legs through to where about half of the short length is above the PVC tube. You can vary this; it's a matter of looks only.

Next, push the end of the PVC tube into the "T", as shown in Figure 3. Be sure to align the bottom of the "T" with the "J" pole. You can use PVC cement to secure these together or you can drill a couple of holes through the two and put in self-tapping sheet-metal screws.

You are now ready to mount the "T" in the top of your mast. You may find in your case that you want to put a piece of PVC tubing in the bottom of the "T" and secure that to your mast. You could, for instance, put a foot or so on the bottom and then clamp that to a steel mast with hose clamps. If you do it that way, put something in the center of the bottom piece so you don't crush the PVC with the clamps. In my case, I was able to mount the "T" directly into the top of my 30-foot push-up mast. I first cut cross slots in the top of the mast, down about one inch. I next slipped a stainless steel hose clamp over the end of the mast and then worked the bottom of the "T" into the mast. Tightening up the hose clamp, causing the end of the mast to squeeze in around the "T", completed the mounting.

Now you will need two $\frac{3}{8}$-inch clamps to connect the coax to the legs of the "J" pole. I made mine out of scrap strips of aluminum, about $\frac{3}{8}$-inch wide and two inches long. I bent them around a scrap piece of tubing and squeezed the ends down with a pair of vice grip pliers. Then I drilled a hole through the flats for # 6 machine screws. Keep in mind that you want the clamps to be tight when you secure them but you also want to be able to loosen them to adjust for best SWR. *Continued on page 67*

Solar Car Race

Searching for an alternative.

by Bill Brown WB8ELK

Since the invention of the motorcar, the desire to achieve peak performance has been one of the main challenges among automotive engineers and designers. The car race has been one of the most instrumental ways to push technology to the limit and help spur some real progress in automobile design. Most of this effort has been put into improving the gas-guzzling combustion engine. There is an alternative.

Photo A. ConVal HS "Sol Survivor" solar car.

Schools across the nation have been experimenting with solar-powered vehicles. Recent advances in the efficiency of solar cells, electric motors and drag-efficient vehicles have made the practical solar-powered car a near reality! Many of these schools need actual road test data to continue with their research. What better way than to pit their car against the designs from other schools in a solar car race!

Photo B. The MIT Solectria solar racer (winner of the racing category).

To this end, the Northeast Solar Energy Association organized the second annual American Tour de Sol race. The objectives of the five-day race from Montpelier, Vermont, to Boston, Massachusetts, were to: 1. Promote solar energy and electric vehicles; 2. Provide a vision of future transportation and solar energy use; and 3. Provide a challenging design problem for engineering students.

Most of these vehicles were capable of traveling at road speeds over 50 mph and over a 50-mile range. The practical solar-powered commuter car is almost here! Since these are experimental vehicles being pushed to the limit over a 234-mile course, breakdowns can and often do occur. Maintenance crews from the various teams needed to know where to respond to help out their entry. Occasionally, some of the cars needed to be towed to the finish line as well. In order for the race director to keep track of each vehicle and its progress, a massive communications effort was necessary.

Hams to the Rescue

Hams from three states and several different radio clubs responded to the challenge! Each day the cars set out on a 30-60-mile course. Hams would set up at checkpoints along the route and report the cars' progress to the race director. Each day of the race, the next radio club or group down the line took over for their area.

Photo C. Daryl WB1DXN operating from the Lake Massabesic checkpoint.

Fifteen solar vehicles started the race from Montpelier, Vermont. Six members of the Central Vermont Amateur Radio Club ushered the racers on their first day as they headed towards New Hampshire. Bob WB1AJG was instrumental in organizing the first-day effort and helped locate any stragglers near the end of the day. Due to the distances covered and the mountainous terrain, three 2 meter repeaters were used to coordinate the effort.

Once in New Hampshire, the NHARA (New Hampshire Amateur Radio Association) took over. The NHARA is a public service organization which draws on the resources of various New Hampshire radio clubs to cover large events like this one. Daryl WB1DXN organized the first leg of the race into New Hampshire and the cars' arrival in the state capital of Concord, with the aid of a dozen volunteers. Coordination was done on the Hanover repeater with Cal WA1WOK operating as net control.

Photo D. Michele Cabana KA1SOA reports the position of a breakdown.

One of the longer legs of the race was from Concord, New Hampshire, to Lowell, Massachusetts. Members of the Interstate Repeater Society (IRS) teamed up to establish 15 checkpoints with a couple of roving mobiles. Daryl WB1DXN and Chick KC1OX kept the race director updated at the midway point at Lake Massabesic. Warren WB1HBB operated as net control from his home. Repeaters in Concord and Derry, New Hampshire, and Lowell, Massachusetts, were used to coordinate the whole effort. At this stage of the race at least three of the solar cars broke down. Some of them had to be towed to the finish line.

None of the solar cars broke down during the final leg of the race. The communications

Photo E. The solar bike. (Photo courtesy of Warren WB1HBB and Donna KA1RWZ.)

effort was organized by Bob WA1IDA who enlisted ten members of the Amateur Radio Support Team. Each Support Team mobile travelled along behind two of the solar racers to help bring them in to cross the finish line at Tufts University in Medford, Massachusetts.

I watched with fascination, during the fourth day of the race, from the starting point at Concord. All of the entries were engineering marvels. However, three of these really attracted my attention. I loved the name of the car entered by Delta College. . . "S-CAR-GO" (Solar Car Go). Another enthusiastic entry was from ConVal High School *[Ed. Note: Just down the road from 73!]* The students from ConVal proved that you don't have to have the backing of a university or college to make it through a grueling race such as this. Their vehicle, "Sol Survivor," lived up to its name and came in fourth in its category! Finally, one of the most unique vehicles was the solar-powered bicycle operated by Team Rosebud. The rider had a solar panel strapped to his back which ran a small electric motor attached to his wheel. Hmmm. . . Maybe next year I'll bring my solar-powered skateboard! 73

The Contenders

Champlain College
ConVal High School
Delta College
Dartmouth College
MIT
Solectria Corp.
New Hampshire Technical Institute
University of Lowell
University of California, Irvine
Solar Car Corp.
Sundriver, Inc.
Team Rosebud
Tufts University

Next year's race is scheduled to run from Albany NY to Boston MA. For more information contact the Northeast Solar Energy Association, 23 Ames St., Greenfield MA 01301. Phone: (413) 774-6051.

73 Review

by Richard Morrow K5CNF

GAP DX-VI Multiband Vertical

Unique antenna = super DX.

GAP Antenna Products
6010 Bldg. J
N. Old Dixie Highway
Vero Beach FL 32967
Tel. (407) 778-3728
Price Class: $220

As soon as I received the GAP DX-VI courtesy of UPS, I hastened to open the box and get the antenna up. But it rained for three days, starting the instant I popped off the first staple. After the monsoon subsided, I assembled the 31.5-foot high antenna on the driveway (see Photo A), which took about an hour and a half—more than just the thirty minutes called for in the instructions. I found the antenna to be well-built, and manufactured of high grade tubing and stainless steel hardware.

George KK4CW, who dreamed this antenna up, informed me that a better instruction manual will be out shortly. If you take your time and don't have to fight mosquitos, you should be able to put the antenna together in about 45 minutes to an hour, or even less. Study the diagrams and sketches carefully first, read the directions and follow them, and you will have no problems. To keep track of the elements, you might also want to mark each section with a marker.

All sheet metal screws and washers come packaged in a Ziploc plastic bag with a nut driver. However, I would advise you to use either a power screwdriver or socket wrench, as you can wear out your hands screwing the antenna together. Be careful to get all the screw holes aligned. To slow down corrosion, I also advise an application of weatherproof coating on each screw and electrical connection, especially if you live near the ocean or in a place where it rains a lot.

Installation

As soon as you have the antenna correctly assembled, you need to put the base section in place. The instructions call for mounting the base section in concrete. I didn't have any concrete, so I used a spare brick. I pounded it into the mud as deep as I could. Crude, but it worked. If you resort to the "pound in the ground" method, put a board over the base section to keep from mangling the top end.

Once the base section is installed and stable, the next step is to raise the antenna into position on the base section. Follow the instructions, and get some help—unless you are built like me, a beer barrel with legs. It's an easy installation with two people, but with just one person the antenna can get away from you and could cause some grief. Be sure to watch out for power lines, too.

Although the antenna is self-supporting, you might consider using insulated guy ropes. Wind can do funny things when you least expect it.

The GAP DX-VI has NO base insulator or coils. This is just one of the things that makes this antenna different from a regular vertical antenna.

Rising Above it All

The 36-ohm base impedance of a normal vertical antenna has to be matched to the 50-ohm transmission line with a matching network. Resistance in the coil of the matching network increases loss. If you use a capacitive matching network, capacitive loss to ground increases at the feedpoint. This means that some of your transmitted power is going to ground currents due to capacitive coupling, instead of into the air, where it should be going.

The GAP antenna's feedpoint is located about 16 feet above the ground. Why? By raising the feedpoint above ground, the coupling to ground is reduced to an absolute minimum, and so is that nasty capacitive coupling. More of your signal gets into the air. This works because, if you go up the antenna from the base, measuring resistance, you will find a point at which the resistance is 50 ohms.

Sixteen feet above ground is also above most RF-absorbing items, like hurricane fences and cars. And the chance of base-loading passing dogs is nonexistent. Other factors that can affect feedpoint resistance in other antennas, such as soil condition and ground moisture, do not seem to affect the GAP antenna at all. As a matter of fact, I was on the air recently during a very heavy rain, and the SWR didn't change, unlike other verticals I have used.

No Tuning? No Radials?

Another very good thing about the GAP antenna is that you don't have to tune it. It comes out of the box tuned. Also, you don't need radials.

To work 75/40 meters, you need three 25-foot long counterpoise wires (insulated) to make the antenna longer on the two lower bands. If you cut a foot off the counterpoise

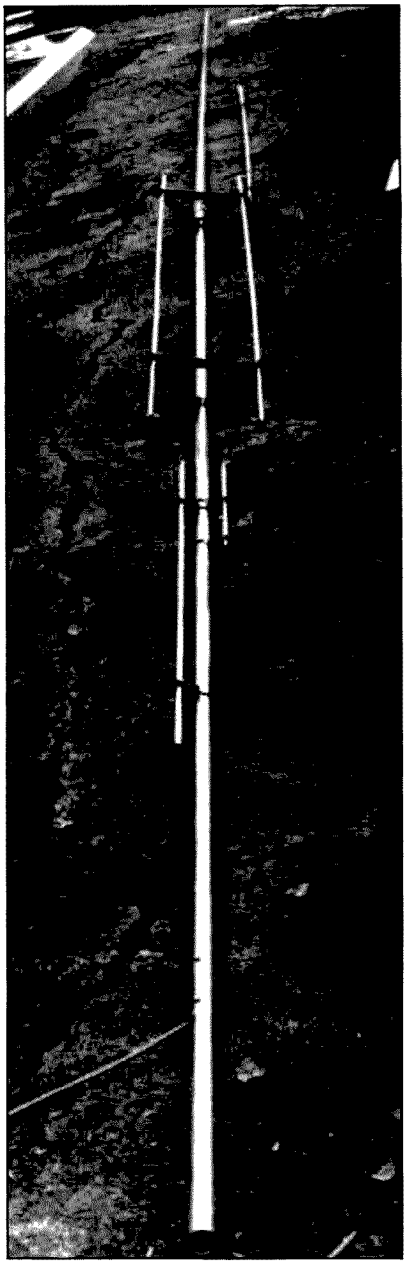


Photo A. The GAP DX-VI, assembled and ready to install.

wires, the current node on 40 meters moves higher up the antenna, cutting losses on that band. I verified this with the old florescent light bulb trick—I waved a small fluorescent bulb up and down the antenna to see where it was most brilliant. Not very scientific, but it works. Just be sure a nonham doesn't see you, as you could end up under a net.

Counterpoise wires for 40 meters usually have to be about 32 feet long, but not with the GAP. If you don't operate on the lower bands, you don't need the counterpoise wires; I verified this by removing the wires. They didn't make any difference at all on 20–10 meters.

The entire antenna radiates on all bands. An antenna that radiates over its entire 31.5-foot length on each band is a lot more efficient than one that radiates from a different part for

each band. The capture and radiating areas are greatly increased on the higher bands.

Into The Fray

On 75 meters, the GAP was compared to a monoband antenna designed by Ted Hart W5QJR. On 75 meter European DX, both antennas do very well, with the QJR antenna about 2 S-units above the GAP. Keep in mind that the QJR antenna was cut for ONE band and has maximum efficiency on 75 meters. The GAP was much closer to the fence and some other items that didn't help it do as well on 75. Still, it did much better than other antennas I've used on this band. Bandwidth on 75 meters was an impressive 150 kHz for a good SWR. [*Ed. Note: An interchangeable tuning cap mounts on the top of the antenna which determines the resonant frequency on 75 meters. The GAP can be ordered centered on 3.6, 3.7, 3.8, 3.9 MHz or a custom frequency of your choice.*]

Forty meters was just fine, and I made enough contacts during the day to tell me that the antenna would do well at night when Europe would start rolling in. Sure enough, the shortwave broadcast stations came in like thunder. On the low end of 40, I heard many stations, both SSB and CW from EA3 to YO3. There were a lot of UA stations, and I heard a call I'd never heard before—UZ1. I missed the rest of the call due to the ensuing pileup. The old Mosley V4-6 never worked this good.

On 20 meters, using just 32 watts PEP I managed to maintain a QSO with VK2FA in Newcastle for about 25 minutes. Brian was coming in between S6–7, and I was on the order of S2-5. I never missed a word.

I made several more contacts, and I was satisfied that this is a real DX antenna. I tuned around and heard signals from all over the globe. OE6MKG was running 20–30 over until the gray line passed his location and the sun came up. GB2SDD was running 10 over, and had a pileup going. It was really surprising to hear so many signals under what could be called dead band conditions.

20 meter CW was the same story, lots of weak but readable DX stations. I heard a flock of calls from the Soviet Union and other parts of the world that I did not recognize. I finally went to sleep about 2:30 a.m., thinking that if my QTH was in a better location, the GAP would be the answer to a poor DX Hound's prayers. I live in what some hams call an RF sponge—my house is surrounded by power lines, TV cables, a shopping center, and a large dairy processing plant.

Operation on 15/10 revealed the same thing. All sorts of DX was coming in, and I made enough contacts to prove to me that the GAP antenna is an excellent DX antenna. I was not able to operate the WARC bands, as the age of my rigs rules that out.

Further observation revealed that the antenna is much quieter than the other verticals I've used. I didn't hear any ignition noise on 10, even though there is a major freeway about a mile from the house and a very busy major throughfare less than 300 feet from my front door.

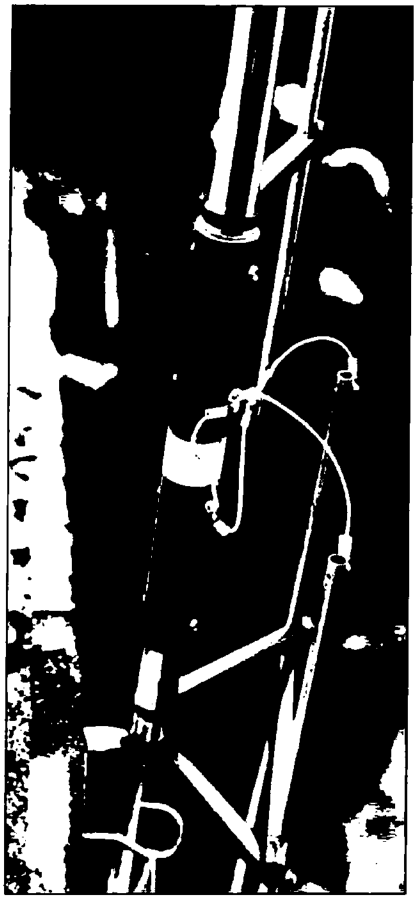


Photo B. The feedpoint, 16 feet above the ground, circumvents the need for an impedance matching network.

Impressions

Usually, broadband antennas are not very efficient, but this one is. Since the antenna is ground independent, all you need for 75/40 is the three counterpoise wires, as mentioned, which you can string in any manner as long as they do not double back on themselves or cross each other.

If you do any shortwave listening or other monitoring in the 3.5-30 MHz range, this antenna will perform very well.

This would be a good antenna for portable use. Since it doesn't have to be tuned, set-up would be easier. You'd need a stout carrier for rough handling, but you could make one out of heavy PVC. Also it's a good idea to bring along a friend to help lift it into position.

Since it is a vertical, the GAP DX-VI will not do as well as a dipole for close-in work (under 800–1000 miles or so), but it will do better than a dipole for QSOs over 1000 miles away. It works on 2 meters, too!

The GAP antenna performed a lot better than others I've used. If I could have only one antenna, I would definitely rather have this one. The lack of lossy coils, and the coverage of a very wide part of 75 meters by an all-band vertical, impressed me more than a little!

Richard Morrow K5CNF, 1706 Melisa Lane, Corpus Christi TX 78412.

Service Survey Wrap-Up

Plus—where to get your old rig fixed.

by Gordon West WB6NOA

In the last six months we've taken an inside look at the factory repair service of Kenwood, Yaesu, ICOM, Ten-Tec, and Alinco. Visiting these companies and learning about what it takes to get your set fixed quickly and completely was an eye-opener. Although each company is unique in its approach to the repair of amateur radio equipment, this six-month survey reveals that the leading manufacturers of amateur radio equipment agree unanimously on the following points:

Manufacturer to Ham

1. IMPROVE YOUR CORRESPONDENCE. The amateur radio service centers want precise details about the radio's problem. Simply taping a "doesn't work" note to the top of the radio is not enough. Give a clear description of what the problem is, whether it is continuous or intermittent, any identifiable conditions under which the problem occurs, the length of time you've had the problem, and any other history that might be relevant. This information will help the technician repair your equipment more quickly and for good.

Better yet, copy and fill out the "Amateur Radio Equipment Repair Request" form that's in the March 1990 issue of *73*. If you don't have this issue, you can order it. If you only want a copy of the form, call or write *73 Magazine* and ask for one.

2. PACK IT BETTER. Because of poor packaging, many radios are damaged while on their way to the service facility to be repaired. This compounds the service problem. You may have sent the radio in for a new volume control pot, but when it arrived, it also needed a whole new circuit board. Like me, you probably threw the original boxes away a month or two after you bought your rig, but you can still take it to a professional packaging and shipping service. Let a professional bundle it up and ship it out, insured.

Hal Guretzky K6DPZ of Land Air Communications suggests that you do NOT label your package "electronic equipment," "ham radio gear," or anything similar. Occasionally, such boxes disappear. If you wish to write something on the box, FRAGILE will do.

3. NO ACCESSORIES, PLEASE. "But I didn't get my little rubber duckie antenna back!" This is a common complaint. Somewhere out there in the radio world there must be some technicians with the largest supply of rubber duckies on Earth. It's easy to forget that you shouldn't send a radio back with everything that came with it. But battery packs, rubber duckies, jack rubber plugs, straps, and similar items, can get separated from the radio during repair.

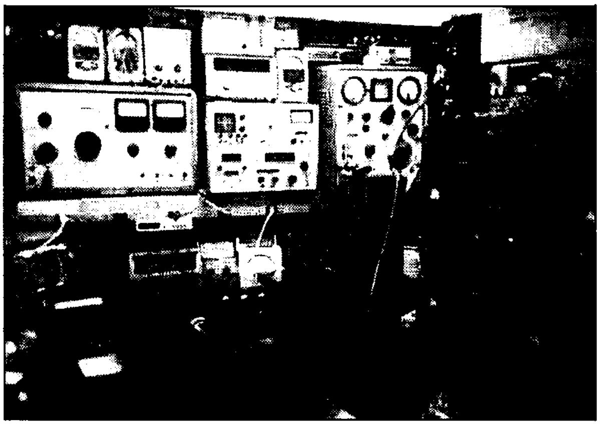


Photo A. The test benches at Land Air Communications are equipped to repair the latest as well as the oldest rigs.

Photo B. Hal Guretzky K6DPZ says it on his license plate.

4. BETTER PHONE NUMBERS. Many times the service manager or bench technician may need to call you during the day to ask a question about your equipment. Be sure to leave your best daytime phone number for them to get in touch with you. Since most technicians don't work at night, your home phone is usually not a good choice. Don't think for a second that they're going to call you at home on Saturday or Sunday, either.

5. BE TRUTHFUL. If someone accidentally spilled a martini in your TS-950, include this in your letter requesting service. Chances are the technician will find the olive anyway—but it may take longer. If you try to camouflage the cause of the problem with an excuse, the technician may look for the problem in the wrong place, delaying the repair and increasing the chance of an incomplete repair.

Ham to Manufacturer

But wait a minute, Mr. Manufacturer/Service Center; hams are also in complete agreement on some points that you may need to ponder:

1. A MORE COMPLETE REPAIR. Many readers wrote that only one or two out of four or five problems were completely repaired. Fixing the obvious is easy. Technicians should spend a few more minutes reading over their paperwork for other faults occurring with the rig under repair. They should also read over the customer's letter carefully.

2. BETTER REPAIR DOCUMENTATION. No ham likes to get his handheld transceiver back with a bill for $150 with little or no explanation about what was done to it. *That* much just to change a tiny 1N914 diode? Better back up big

bills with details on what you're charging the customer for.

3. KEEP ME INFORMED. Nothing is more aggravating than not knowing whether the factory received the rig or not, how long it's going to take to get it fixed, and an accurate estimate of how much it will cost. When the unit is received, every company should immediately send a postcard to the customer, indicating receipt of the equipment, with instructions on how to track the unit down for a status check. The postcard should also state the estimated time and cost of the repair. If the unit is being shipped back to the customer C.O.D., does C.O.D. mean cash or a cashier's check, or is a personal check OK?

Land Air Communications L.T.D.

Older sets may be fixed quickly if the parts are still available and a technician takes a special interest in the project. Originally, this last service survey article was to include a tour of the service center of G.E. Electronic Services. Since last July, however, G.E. is no longer repairing amateur radio equipment, new or old.

East Coast hams are luckier. Hal Guretzky K6DPZ, owner of Land Air Communications, says, "We specialize in used equipment, both sales and service." While I haven't had a chance to personally inspect his facility, I did receive letters from several readers indicating that Land Air Communications fixed their equipment, which had been pronounced dead by others.

Hal Guretzky has plenty of used gear for sale, plus elaborate test benches which meet the requirements for a well-equipped repair facility for the latest models of microprocessor-based ham transceivers. Says Hal, "My formula for repairs is: If the cost of the repair is more than half of the used replacement cost, the customer will be informed, and he has the option to have the rig repaired or not. If he chooses not to, the only charge is the cost of shipping the equipment back to him."

Hal's reputation is known across the U.S. Repairs come in from as far away as California. According to Hal, his license plate says it all (see Photo B). For more information, call or write Land Air Communications at 95-15 108 St., Richmond Hill NY 11419. Tel. (718) 847-3090. FAX (718) 849-8279. Add them to your arsenal of independent fixers.

That's it, folks. Half a year of exploring a dreaded subject—radio failure and how to get it fixed quickly. Hams are quite vocal about the kind of repair service they get from manufacturers and service centers. While the major manufacturers provide good service, turnaround time may vary with a shortage of qualified technicians. And as Wayne Green has pointed out so aptly in his editorials, good service technicians are getting harder and harder to find.

Do your part to get good service. State your problem clearly, pack your rig up well, ship it out right away, and chances are you'll get your rig repaired in a reasonable amount of time. ■

The ZED LOOP Special

An inexpensive HF beam with a new twist.

by Jim Gray W1XU

The "ZL Special" antenna, named after ZL3MH who first designed it, is well-known to enthusiasts who want a simple, easy-to-build, inexpensive, high-performance wire beam. Basically, the ZL Special consists of two folded dipoles fed out of phase to provide a strong radiation lobe in one direction, and signal cancellation off the back. It is a slightly different version of the famous "8JK" antenna designed and published by John Kraus W8JK in the 1930s. John's articles appeared in *QST* between 1935 and 1938, and more recently in 1989. Another tried-and-true version of the ZL Special appeared in "Broom Handle Beam," written by John J. Scultz W4FA in the January 1989 issue of *CQ*.

The Ideas Click

My own experience with the ZL Special goes back to 1958, when I built one from twin-lead, using vinyl tape to attach the elements to some bamboo poles. These, in turn, I attached to a small wooden framework that could be rotated by a light-duty TV rotator. I fed the beam with 75 ohm coaxial cable and used it with remarkable success on 15 meters.

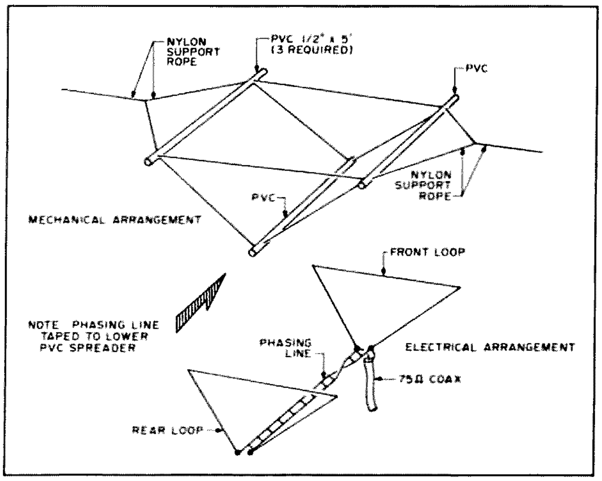
With the advent of the new sunspot Cycle 22, and the sudden and drastic increase in 10 meter activity, I decided that I'd need a beam for my QTH, which is on a small, tree-covered lot with no tower or possibility of one at present. I considered using a 20 meter delta loop beam I'd made for DX back in New Hampshire.

That one had quarter-wave spacing between the elements and a neat design for changing direction from the shack by merely switching an extra quarter-wave length of coax into the feeder arrangement. I could instantly change the direction of the beam by 180 degrees. It worked very well, and got me some new countries in spite of my 100 watt transceiver.

Then the idea clicked: Why not incorporate the best of both antenna systems—a delta loop pair, separated and phased in the ZL Special manner? I devised (on paper) a suspension system for making it into a fixed-direction antenna—the better to work those elusive Europeans from Arizona, and also to enable me to work my old friend N1DQM back in New Hampshire. The result is shown in the figure.

A 10 Meter Version

I used the formula of 1005/F (MHz) for the forward element and 1055/F (MHz) for the rear element. Obviously, both elements are "driven." I used a physical spacing of 5 feet between delta loops, and a 6-foot length of 450-ohm ladder-line as the phasing section. *Formula = 150/f for 450 Ω line length and 120/f for loop spacing*. (If you wish, you can make the phasing line from 300 ohm twin-lead, although it will have a slightly shorter length.)



The Zed Loop Special.

As you can see, the coax cable is attached without a balun (although you may use one if you wish) to the junction of the forward loop and phasing line. You will notice that the phasing line has a half-twist in order to place the antenna currents in the proper phase relationship to give forward gain and backward rejection. I reasoned that the loop arrangement would give slightly more gain than the folded dipoles and provide the inherent quietness of a loop, plus the broad-banded nature provided by their low *Q*. The dimensions of the loops themselves turned out to be 35′ for the forward element and 37′ for the rear element, at 28.5 MHz.

The design, sketching, and calculating took about two hours in the evening, and the construction, assembly and erection took two hours in the afternoon of the following day. I used ½" PVC pipe from the hardware store for the spacers (at a cost of $4.34 including tax) and nylon line for the supporting ropes. The wire for the loops and the 450 ohm phasing line were salvaged from other antennas. If you have to buy everything new, you can put this antenna together for 10–15 dollars.

After hoisting the beam to its resting height of 25 feet in a hammock-like position, I connected the transceiver and listened. Wow! Signals were pouring in from all over the Northeastern U.S. with strengths of at least 1 to 2 S-units greater than my vertical antenna. A few calls produced as many replies, and those with whom I spoke all wanted more information—hence this article.

Dimensions of the Zed Loop Special

Band/Freq.	Reflector	Driven Element	Phasing Line	Spacing
Formula used:	*(1055/F MHz)*	*(1005/F MHz)*	*150/F MHz*	*123/F MHz*
10 M/28.5 MHz	37 ft.	35 ft. 3 in.	5 ft. 3 in.	4 ft. 4 in.
12 M/24.9 MHz	42 ft. 4 in.	40 ft. 4 in.	6 ft.	5 ft.
15 M/21.3 MHz	49 ft. 9 in.	47 ft. 5 in.	7 ft. 1 in.	5 ft. 8 in.
17 M/18.1 MHz	58 ft. 3 in.	55 ft. 6 in.	8 ft. 3.5 in.	6 ft. 9.5 in.
20 M/14.2 MHz	74 ft. 4 in.	70 ft. 9 in.	10 ft. 6.75 in.	8 ft. 8 in.

The feedpoint impedance was such that I had a VSWR of 1.4:1 at the 28.500 MHz design frequency. This was maintained all the way down to 28.000 MHz. The VSWR increased to 2:1 at 28.8 MHz—yielding an effective bandspread of about 800 kHz for this antenna. Perhaps by "centering" it a bit higher, I could have easily covered the entire 10 meter band with an acceptable VSWR. As a matter of fact, I have used it on 12 meters (with an antenna tuner) and received excellent reports. It does appear to have almost equivalent directivity on 12 meters, but this has not yet been fully determined. For best results, I would recommend a version cut especially for 12 meters. See the table for dimensions.

The length of the phasing line depends on the velocity factor of the material used. For example, the velocity factor for 450 ohm ladder-line is taken to be about 0.92. The formula 150/F as shown in the table is empirically derived, and seems to work well.

You may try different lengths of phasing line to change the F/B ratio or the forward gain of the beam—or even the feedpoint impedance.

Loops may be triangular (delta loop), square (quad loop), round (circular loop), or any other regular, convenient polygon. You may wish to try feeding your loops at a different point to take advantage of polarization diversity. Both loops should be fed at the same point, however. Feeding the vertical side of a quad loop gives vertical polarization, while feeding the horizontal side gives horizontal polarization. If you use a true delta loop (point up), feed one bottom corner; if you use an inverted delta loop (point down), feed the point or the middle of the top side. Experiment for best results.

Good Gain, Easy Mount

Results so far are very encouraging; the stations I've worked have given me extremely favorable S-meter reports. I only have a problem when I want to beam a signal in the other direction. This requires unfastening the hammock from its end support ropes and physically turning it around and re-hoisting it. Tedious, yes, but not all that bad, really.

What is the gain? Compared to my vertical, I see about a 2 to 3 S-units improvement on receive. That's ridiculous, I know, so let's say about 4 to 5 dB relative to a dipole—perhaps a tad more. The front-to-back ratio appears to be phenomenal—I haven't heard any signals off the back as yet. My conservative guess would be 25 dB. Front-to-side ratio is probably about 25 dB or more, as signals off the sides are practically nulled out.

You can build your own easily and cheaply in a short time. I think you'll be pleasantly surprised. Naturally, if you don't have trees for end supports, you can use your house, a tower, a couple of zoom-up masts, or whatever you find handy. Ready to raise, the antenna weighs less than five pounds, and doesn't require a major support. ■

Jim Gray W1XU can be contacted at 210 East Chateau Circle, Payson AZ 85541.

A Visual CW Offset Indicator

Add the feature the manufacturers forgot.

by F.A. Bartlett W6OWP

Before transceivers became "state of the art" and the receiver and transmitter were separate entities, zero-beating a CW transmitter to the station called or worked was a simple matter: Briefly switch on the VFO, and zero in on the incoming signal. When transceivers appeared on the scene, difficulties arose. In early designs, tuning for an acceptable beat moved the transmitter frequency so the two stations ended up a beat note apart.

Modifications followed. First, a fixed CW offset of 600–800 Hz was provided. When a signal was tuned in, the transmitted frequency would be somewhere near that of the station being received. Next, to make the setting more accurate, a sidetone monitor producing a tone exactly equal to the amount of offset appeared in most transceivers. By matching the incoming signal to the sidetone, transmitting frequency would be the same as the received frequency. But theory and practice are sometimes at odds. Procedure for matching the two tones is awkward and time consuming. Instruction manuals haven't helped—often being vague in describing the procedure or omitting it entirely from paragraphs on CW operation. Perhaps some "state of the art" updating is in order.

This article describes an easy-to-build unit that provides a visual indication at signal and sidetone match. The indicator, built around an LM567 tone decoder IC, operates full-time; you don't have to push a button. Just tune in the signal and watch the indicator's LED. Rusty Darting KB6EME suggested this application of the LM567, based on an indicator built for his Kenwood 430.

The LM567 is an 8-pin, phase-locked loop IC; a lock between its internal Voltage Controlled Oscillator (VCO) and the applied signal brings its output pin low. Adapted to indicate CW offset, the VCO is set to the offset frequency. In most transceivers, this is the sidetone frequency. Received audio is monitored, and when the beat note matches the VCO, an LED turns on.

A Small Package

Figure 1 shows the schematic diagram. Circuit values are optimized for the 600–800 Hz range. Operating voltage is zener-regulated at 6.2 volts, taken from either a 13.8 or 8-9 volt source. Power may be available from an accessory port on many transceivers. Audio is taken from the speaker or headphone output. There is no insertion loss. Current consumption is 14–16 mA.

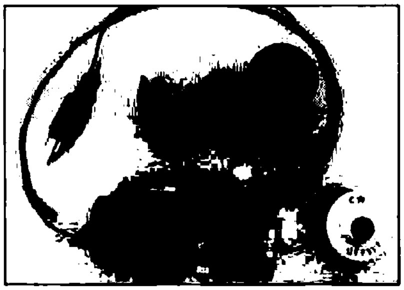


Photo A. The CW Offset Indicator, ready for installation. A 35mm film container makes an ideal housing.

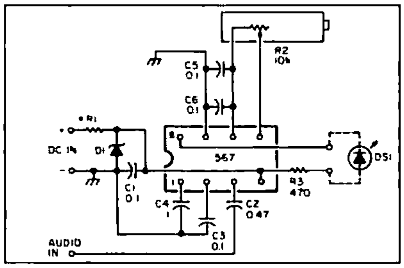


Figure 1. Schematic of the CW Offset Tuning Indicator.

The whole assembly requires a very small board. Although you could fit it into almost any transceiver, drilling the front panel to mount the LED is something few owners would care to undertake. As a practical alternative, a "recycled" 35mm film container proved to be an ideal housing for an add-on unit. See the component assembly in Photo A.

A printed circuit pattern is shown in Fig. 2. However, assembly is simple enough for wired construction on perfboard or a Radio Shack #276-150 board cut to size. Dimensions are 1-1/2"L x 1-5/32" wide to fit the film container. Two 5/16" holes are drilled in the latter, one in the end for connecting leads and the other in the cap for the LED. These holes are fitted with 5/16" grommets. A standard LED fits this size grommet, making a holder unnecessary. The IC is mounted with an 8-pin socket. Before assembly, R2, the VCO tuning control, is set to mid-range. Except for the LM567, all electronic components are listed Radio Shack items. The 567, a common IC, should not be difficult to find.

Two types of mounting clips are shown in Photo A. Each is made from a thin metal strip 1" wide, the circular portion of which is formed around 1" diameter tubing. To attach it to a heat sink, fit it between the fins and press lightly. If the transceiver has a steel cover, a magnet mount is a practical choice. The clip is formed with a flat base to which a small circular magnet is epoxied.

Adjusting R2

A one-time adjustment of the VCO tuning control R2 is required. The VCO must be accurately set to the transceiver offset. Most transceivers manufactured the past two decades have related offset to the sidetone frequency. With the sidetone activated, R2 is adjusted for maximum LED indication at the lowest level that provides response.

Some transceivers provide adjustable sidetone, others a BFO or Pitch control. If reference to the instruction manual shows settings that equate sidetone to the CW offset, the procedure is the same as in the preceding paragraph.

If the sidetone frequency is in doubt, and the digital readout displays both receive and transmit frequencies, the CW offset will be the difference in readings taken when the RIT or other beat note control is turned off or at zero setting. If only the receive frequency is displayed, the specified offset may be used in conjunction with a marker check point to reach a close approximation of the frequency to which the VCO should be set. With the selected marker carefully tuned to zero beat, the stated CW offset is subtracted from this reading and the resultant frequency tuned in. The beat produced is used to set the VCO. For example, if the marker reads 3600.00 and the specified offset is 800 Hz, you would tune to 3599.20 kHz.

Operating Notes

In using the CW Offset Indicator, the beat note control (RIT, Clarifier, Pitch Control, etc.) must be turned off or at zero setting, the same as normally prescribed for initial tuning. Once the signal is centered within the LED response, use the auxiliary control to choose your preferred beat note—or, if you're using a computer interface, to provide correct frequency.

If you've worked with the LM567 IC, you may question the wide range of levels pre-

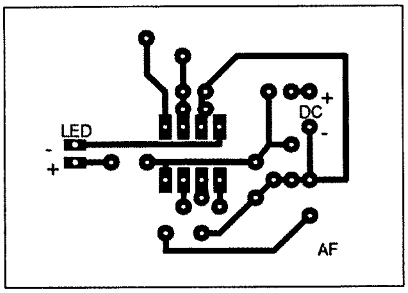


Figure. 2 Actual size foil pattern.

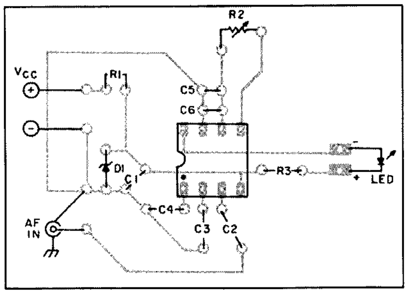


Figure. 3 Parts placement (top view).

sented to the decoder input. Recognizing that a broadening of response may occur at higher levels, I tried a number of input conditioning arrangements. I found that the added complexity coupled with more critical tuning negated any advantage.

Two factors are involved here. First is the increase in acquisition time for "lock" as the difference between signal and VCO frequencies widens. Since the incoming signal is keying, valid indication occurs at a closer frequency match than if a steady tone were tuned in. Secondly, input conditioning free from harmonic responses moves the indicator out of the simple add-on category. But once you're familiar with the unit, typical accuracy is on the order of 60 Hz. Tuning at reduced volume can bring this figure down to 10 Hz or less. ■

F.A. Bartlett W6OWP, 6306 Tabernacle Lane, Paradise CA 95969.

Parts List

C1, C3, C5, C6	RS# 272-1432
C2	RS# 272-1433
C4	RS# 272-1434
D1	6.2V zener, 1W, RS# 276-561
DS1	T1-3/4 yellow LED, RS# 276-021
DIP socket	8-pin, RS# 276-1995
R2	RS# 271-343
R3	RS# 271-1317

Notes

R1 is 470 ohms, ¼W for a 13.6 supply source, RS# 271-1317. For an 8–9V source, use 180 ohms, RS# 271-014.

All capacitors are 35V tantalums. C5 and C6 are paralleled because Radio Shack doesn't stock 0.2 µF tantalum.

A blank PC board is available for $3 plus $1.50 shipping per order from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

Dx

Number 16 on your Feedback card

Hams Around the World

Bob Winn W5KNE
℅ QRZ DX
PO Box 832205
Richardson TX 75083

QSLing Practices: The Dark Side

Aside from the exhilarating thrill of making a contact with a new and rare country, receiving a coveted QSL card is often the high point of the contact. Many DXers want to receive their QSL from the "new one" tomorrow, or even next week, but immediate receipt of QSLs is usually the exception rather than the norm.

Why can't we get our QSL cards within a "reasonable period of time"? For several reasons. First, the definition of "reasonable period of time" is a relative measurement. "Reasonable" from a QSL manager's viewpoint takes on an entirely different meaning when filling out thousands of QSL cards rather than one or two. Second, we must remember that amateur radio is a hobby and QSL managers must work for a living—they cannot spend every waking moment filling out QSL cards.

Please understand that the waiting time for a QSL from an established DX operator or QSL manager is normally considerably shorter than the wait for a card from a DXpedition. An established DX operator or QSL manager already has the QSL cards on hand and does not usually receive hundreds of cards each day. There are numerous delays built into DXpedition QSLing: travel time from the DXpedition QTH to the home QTH, time required to design a QSL, time required to print fancy QSL cards (good quality color photo QSL cards often require a minimum of six to eight weeks processing time), etc., etc. The majority of DXpeditions QSL as soon as reasonably possible. A few don't, but they are definitely a minority.

Sometimes DXers themselves help cause QSLing delays. If you wait several weeks or months before mailing your QSL card, then obviously your QSL request will go to the bottom of a huge pile of other requests. The size of the pile, the accuracy of your request and the efficiency of the QSL manager then determines when you receive your QSL. Other common reasons for QSLs being delayed include: the wrong date or time on the QSL card, multiple QSLs for different bands in one envelope (especially if the QSL manager has a helper for each band, if each band was recorded in separate logs, or if one of the QSOs is "not in the log"), no self-addressed envelope, no return postage (or IRCs, green stamp, etc.), or the QSL was sent to the wrong person or address. And, mail does get lost, both enroute to a QSL manager and in return.

If you follow a few basic rules QSLing should not be painful and delays should be minimized. Fill out the QSL accurately using UTC time and date. Always provide a self-addressed (SAE) or self-addressed and stamped (SASE) envelope with your QSL. Always provide sufficient return postage. As a general rule, it is best to omit any mention of callsigns or amateur radio on the envelope. IRCs and green stamps should be hidden inside the envelope to prevent theft. Use an outside envelope that is large enough to accommodate an *unfolded* SAE inside. Do not use fancy commemorative postage stamps.

If all of your friends who QSLed around the same time you did have received their cards and you have not, THEN it is time to re-QSL, not before.

QSLing, Proposed Standards

QSLing is one of the most discussed subjects in DX publications, on the air, and wherever DXers gather. Because of this, several organizations have proposed QSLing standards that sound great in theory, but have little chance of actually controlling QSL managers. Let's face the facts—this is a hobby and there is no realistic method of enforcing rules for QSL managers. However, the proposals from two IARU-affiliated European societies are worth studying.

Code of Practice for QSL Management from the RSGB (United Kingdom)

1. Any DX station appointing a QSL manager must ensure that satisfactory arrangements are in place for receiving and responding to the bureau as well as direct cards. Adequate publicity must be given to such arrangements.
2. QSL managers must respond to incoming SWL cards.
3. Any DX station appointing a QSL manager must accept responsibility for that manager's performance.
4. QSL managers must respond "direct" and within a reasonable period of time as long as sufficient funds/IRCs/stamps to cover the exact cost of return postage (and a return envelope if one is not supplied) are enclosed with the request. Air mail must be used if sufficient funds/IRCs/stamps are enclosed.
5. QSL managers must not insist on separate envelopes/applications for different QSOs or different stations. They must establish internal procedures to handle such multiple requests.
6. Recognizing that mistakes of time and/or date are frequently made, QSL managers must make a reasonably diligent search for QSOs that cannot immediately be found in the log.
7. In particular: It is unacceptable to demand a specific number of IRCs or "green stamps" if a smaller number would cover the cost mentioned in point four. It is unacceptable to return cards via the bureau if they were received direct with sufficient funds/IRCs/stamps as defined in point four.
8. There should be no time limit for applying for QSL cards. Old logbooks should be passed to responsible DX clubs when the manager no longer wishes to retain them.

QSL Manager's Code—REF (France)

Considering:

That the great demand for cards from rare countries has given rise to the institution of QSL Manager, a corps of radio amateurs who volunteer to act as QSL administrator on behalf of amateurs located in sought-after countries;

That tribute should be paid to the performance of these QSL managers, who during many years spend their energy and their spare time in the service of radio amateurism, without any return;

That, however, in a few regretful cases, the radio amateurs find themselves confronted with a QSL manager whose operation is not up to par;

That experience has shown that a malfunctioning QSL manager can create worldwide discontent and commotion;

That, although QSL managers act as individuals, not commissioned by a member society or IARU itself, their activity is closely linked to the smooth functioning of the known awards of world reputation;

That the IARU and its member societies have set up and operate a worldwide QSL Bureau organization through which pass practically all the worldwide issued QSL cards, including those destined for the attention of the above mentioned sought-after cards;

That many or most QSL managers make use of the IARU QSL Bureau organization (incoming, outgoing, or both);

That the incidents that have taken place justify a reflection on IARU level whether measures are called for so as to avoid incidents in the future;

Proposes:

In the first instance, to draw up a "QSL Manager's Code" which could be widely published in the amateur press and therefore become widely known and accepted by the DX fraternity as the standard of good behavior;

Suggests:

That such a QSL Manager's Code also constitutes a tool which can be used by the award issuing member society or any other body in case difficulties arise in the normal forwarding of cards destined to obtain their awards (for example by having the Code signed by the manager);

Furthermore Suggests:

That such a QSL Manager's Code could stipulate among other clauses the following points:

The QSL manager is a volunteer who puts his effort to the service of his fellow radio amateurs, without any return, retribution or advantage of any kind;

The QSL manager aims at forwarding the cards entrusted to him by his mandator within a reasonable time span and at the lowest cost possible;

The QSL manager fills out his mandator's cards in accordance with his mandator's log sheets;

The QSL manager who uses direct mailing accepts the reimbursement of the mailing cost by means of the number of IRCs as prescribed by his local post office. He will not accept any payment in money;

The QSL manager, for cards to be sent within his own postal territory, accepts the stamps valid for use in that territory;

The QSL manager refrains from criticizing the layout or contents of the cards destined to his mandator;

The QSL manager who uses the services of the QSL Bureau within his country acts in conformity with the latter's instruction.

These are the proposals. Put yourself in the position of a QSL manager, who has thousands of QSL requests piling up, many of them violating many of the basic rules of QSLing. Are these proposed standards realistic?

South Georgia and the South Sandwich Islands

As this column is begin written in July, Tony WA4JQS, organizer of the South Georgia-South Sandwich Islands DXpedition, says planning is continuing. The operators will meet the ship *Indiana* at Puntas Arenas, Chile, on November 14. The ship will then proceed to Port Stanley, Falkland Islands, to pick up generators and other items (November 17). The callsigns to be used for the two separate operations are VP8SGI and VP8SSI. The beginning dates for the operations are around November 22 for VP8SGI and November 26 for VP8SSI. The total cost of the transportation is reported to be $140,000. A large sum of money is still needed (donations via AA6BB/7) to help make the down payments for the transportation. ■

Continued from p. 30

ception, over 50 WPM, but is more susceptible to noise. The HI setting is most effective in reducing the effects of noise but will also attenuate code transmission over 35 wpm. To change the Filter setting, press *F* followed by the "+" or "-" key to increase or decrease the value.

The *R* key restores the above parameters to their "nominal" values.

The main screen is divided into two sections: copy and scratch pad. The copy area continuously displays the incoming code. In the scratch pad area, enabled and disabled by pressing the space bar, you can capture those parts of the incoming message that you want to keep for reference. You can clear the copy area by typing a *C*, and the scratch pad by typing an *S*.

All of this information is available in the on-line HELP section. Press *H* to access this data.

What To Expect

With a little practice and a good quality receiver, ROBO-COPY is capable of copying signals as weak as S4 to S5 without excessive errors. Being able to copy CW at high speed for long periods of time adds a new dimension to this mode of communication. However, as with human operators, high levels of QRM and QRN will obliterate the incoming message. It's least effective when several stations are sending at once, such as in the chaos caused by pile-ups.

Where to Get ROBO-COPY

Send $5.00 (for postage and handling) along with a FORMATTED floppy, either 5¼" or 3½", and a rigid, self-addressed disk mailer to: Mike Hansen/WB9DYI, 1405 Tanglewood Drive, Algonquin IL 60102. ROBO-COPY is not copy-protected and may be copied and distributed freely for private use only. Save multiple postage and handling fees by copying the software for friends and club members. *[Ed. Note: The ROBO-COPY program (ROBO.EXE), a detailed description of the CW receive algorithm (ROBO.TXT) and the 'C' source code listing (ROBO.C) are all available free on the 73 BBS under the 73mag SIG. The BBS number is (603) 525-4438.]*

My thanks to Bruce Brazelton W8MHW for his assistance in reviewing this article.

Michael C. Hansen WB9DYI, 1405 Tanglewood Drive, Algonquin IL 60102.

Parts List

B1	9V transistor battery
C1	0.047 µF @50V, Mylar™
R1	4.7k, ½W
Q1,Q2	2N3906 or equivalent
D1	1N914 or equivalent
D2	LED
R2	470Ω, ½W
C2	4.7 µF @10V
T1	110V to 12.6V @300 mA, RS #273-1385A
L1	large toroid
C3,C4,C5	0.01 µF @50V, ceramic

Number 17 on your Feedback card

HOMING IN

Radio Direction Finding

Joe Moell, PE, K0OV
PO Box 2508
Fullerton CA 92633

Try UHF and SAR

Radio direction finding (RDF) enthusiasts are always looking for new challenges. The latest in the Los Angeles area is UHF. A competitive transmitter hunt on the 440 MHz FM band starts at 2 p.m. on the first Sunday of each month, with boundaries that include parts of four counties—over 2300 square miles total.

T-hunting on 440 isn't completely new. Ham TV enthusiasts have done it in the past. If you have only hunted below 150 MHz, you're in for a real surprise on your first 440 MHz hunt. It seems as if every object in the universe reflects 440 MHz signals. UHF waves bounce like a million ping-pong balls. Unlike HF signals, which propagate by ground wave or ionospheric refraction, UHF signals carom around, scattering off buildings, hills, cars, overpasses, canyon walls—you name it.

On the most recent hunt, almost all the teams drove north from the starting point and spent the afternoon scouring several foothill cities 13 miles north, following bounces. The transmitter was actually 17 miles southwest of the start point, but the signal could not be heard from that direction at the start, due to shielding by intervening hills. The signal went up Brea Canyon, around the starting hill, and "lit up" all the northern mountains.

If you think you're an unbeatable foxhunter, try 450 MHz for a humbling experience. Now, let's see who will be the first to set up a hunt on the 1.2 GHz band!

Triangulation by Packet

Several local hams have begun to hold QSOs from their base stations during the Saturday night mobile 2 meter hunts. They exchange their bearings on the fox via packet radio, in an attempt to figure out where the hider is without going out on the road. Last hunt, their collective guess was within two miles of the actual hiding spot. Not bad—I wonder which mobile hunter will be the first to put a packet terminal in his hunt vehicle to eavesdrop on these folks.

A large fraction of the southern California T-hunters are active on packet. Tom Ritchie N6FBH saw this as an opportunity. He has set up the first dedicated T-hunt packet bulletin board system (PBBS). If you connect to N6FBH-1 on 145.05 MHz, you can exchange messages with other T-hunters, read the results of recent hunts, and download schedules and rules for the dozen or so hunts in the upcoming month.

Because Tom's board is limited to T-hunting activities, it is not in the Westnet mail system. If you want to send him a packet message and can't get into his PBBS direct via a digipeater, send it to N6FBH @ WB6YMH-2.#SOCAL.CA.USA.NA. If your message is of interest to all hunters, I'm sure he will move it from YMH to his PBBS. By the way, you can also send packet messages to me at WB6YMH-2.

Be a Life Saver

Words can't describe the excitement of being the first foxhunter to find the hidden transmitter and win the hunt. If you have tried your hand at it, you are probably nodding in agreement. But did you know there could be an even greater T-hunting thrill awaiting you? Your skill and your gear could save a life!

Most hams have heard of Emergency Locator Transmitters (ELTs). These 100 milliwatt units (see Photo A) activate on impact when an aircraft goes down, giving the survivors a chance to be located and rescued before being overcome by their injuries or by exposure to the elements. In a soft emergency landing, victims can activate the ELT manually.

When an ELT comes on the air, someone with RDF expertise has to find it right away. Responsibility varies from area to area. Civil Air Patrol (CAP) volunteers take on the task in many parts of the country.

Veteran CAP member Jerry Wellman works for two Utah newspapers by day, and uses RDF to save lives in his off hours. He has been involved in search and rescue (SAR) for 20 years. Many CAP members are hams; this led Jerry to get his own license (WB7ULH) ten years ago, and add Amateur Radio Emergency Service (ARES) to his activities.

"Some time back, a guy crashed into one of our canyons in bad weather," Wellman recalls. "He sort of pancaked it in. We picked up the ELT and did a classic response, with the sheriff, the CAP, some hams, and a plane. It went right together. One guy was killed in the crash, but the other survived. We had an Army chopper come in and got him out. Another three hours and he would have died in the snowstorm." This is the typical scenario of a Utah CAP SAR mission—a light plane going down in rugged mountain terrain. If the crash site is high, the ELT signal may be heard at an airport or at some of the VHF/UHF ham and CAP repeaters that are equipped with auxiliary 121.5 MHz distress frequency receivers and alerting circuits.

If, as often happens, the plane ends up in a deep canyon, the ELT signal is usually reported first by a passing commercial flight. Airline pilots are urged to monitor 121.5 MHz at all times for this reason.

The ELT signal may also be picked up by one of the search and rescue satellites (SARSATs). ELT signals picked up by these low altitude US, French, and Canadian birds are processed at Scott Air Force Base in Illinois. (Soviet COSPAS satellites are also part of the system.)

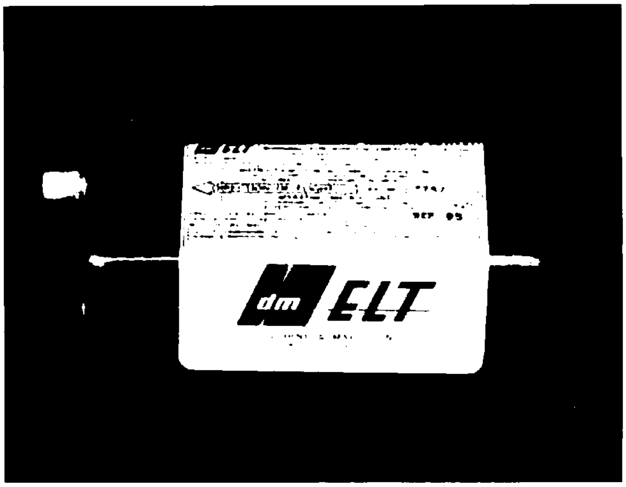


Photo A. This Emergency Locator Transmitter mounts in the tail of a small plane, and activates on impact. (Photo by WB6UZZ)

The SARSAT center computers perform a special kind of Doppler RDF. It is not the same scheme used by mobile Doppler units with ring antennas. Instead, SARSAT uses the Doppler frequency shift observed on the ELT signal by the satellite due to its rapid velocity as it passes overhead.

Data from a single satellite pass over an ELT normally locates the site within 25 miles. Computations from multiple passes can improve the "fix" down to a fraction of a mile.

Pilot's Choice: Dual Antennas

If weather permits, RDF-equipped CAP aircraft lead the search mission. Airborne RDF antennas must be stationary and not add appreciable windload to the plane. No rotating yagis or quads here! Dual antenna switched-pattern sets such as the L-Per by L-Tronics are the overwhelming choice. Their ruggedness and simplicity make them useful on a plane or as a hand-carried unit in the wilderness. "We even used one successfully on a helicopter," Wellman says.

As with other RDF efforts, experience and training have no substitutes. Sure, an inexperienced RDFer can tape a couple of antennas to a plane's windshield and go on a search. But planes with permanently mounted antennas and experienced pilots almost always do better. Every aircraft is different, and the middle of a SAR mission is not the time to be learning the eccentricities of a new airborne RDF lashup for the first time.

CAP constantly emphasizes the importance of practicing RDF skills in advance of need. "Most pilots," says Wellman, "need continuous training in RDF to be effective. For a while, we were having drills where we'd ask someone to take an ELT and hike into the mountains and hide it on 121.6 MHz for practice. They did some interesting things to test us: unusual antenna positions, putting the ELT inside a steel barrel, and multiple ELTs." The best volunteers take advantage of every opportunity to get out in the field, either on training runs or actual missions. "Whoever is going," says WB7ULH, "I'll go with 'em."

The biggest problem with the ELT system is false alarms. SAR people have learned to check nearby airports first when an ELT alarm is heard. In an overwhelming majority of cases, the signal turns out to be an accidental actuation caused by a hard landing or other non-emergency. One estimate places the cost of tracking down these false alarms at two million dollars per year.

Wellman tells the story of one bad Utah windstorm. "It set off two or three ELTs, and a pilot crashed into the mountain at the same time.

"We were DFing all the false alarms, but as we turned them off, we could still hear an ELT signal. It turned out there was a guy alive on top of a peak at about 9700 feet. A couple of days later he was found; it took that long to get to him. The para-rescue people from Hill Air Force Base jumped into the site. He was critical, with probably only a couple of hours left."

Get Involved

If you would like to use your T-hunting skills for a valuable public service, contact your local office of the CAP.

It isn't hard to think of other situations where RDF could be a lifesaver. How about finding endangered hikers? Anyone lost or injured in the wilderness who carries a beacon transmitter will be much easier to locate.

We hams always carry our HTs when we're out in the woods, right? But what about everyone else? The FCC has proposed a new public radio/RDF service, called Personal Emergency Locator Transmitter Service (PELTS), at the suggestion of a ham in Oregon. Already it is embroiled in controversy. Come back next time for a careful look at this proposal.

Number 18 on your Feedback card

ATV

Ham Television

Bill Brown WB8ELK
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Go Fly a Kite!

Last year I gave an ATV demo at the Findlay (Ohio) Radio Club. After the presentation, Jon WM8W approached me and said "Why don't you take your ATV system and go fly a kite!" This was not meant as an insult—Jon had been planning to build a monster kite for some time and thought it'd be great to fly a TV camera for some great aerial views.

Jon paid a visit to a store that specializes in kites of all sizes (*On the Wind, Heritage Square, Grand Rapids OH 43522; (419) 832-KITE*). Pam Sherwood, the

Photo A. The monster kite in flight. (Photo courtesy of Mike Dawson.)

owner, recommended a large delta wing design for the best combination of stability and lift capability. She let him borrow a big 12-footer for the first attempt. Jon mounted a 2-pound payload consisting of a video ID and 80 milliwatt ATV exciter on the string about 50 feet below the kite. The first flight took the payload up to 500 feet, resulting in good reception out to 20 miles and sync bars out to 60 miles. The need for a bigger, reinforced kite became evident when a wind gust broke the main spar! The kite and payload fluttered back to the ground heading directly for the railroad tracks. The train whistle confirmed his worst fears. The kite was on a collision course with the 5 p.m. Baltimore and Ohio freight express!

Jon figured they would probably charge him fare, so he reeled in the line as fast as he could, narrowly missing the train. This episode convinced him he needed a much larger kite, capable of lifting at least four pounds. Raw materials were gathered up from the kite store to put together a massive 16-foot delta wing. (Jon's new kite was mentioned briefly in the February 1990 "ATV" column.)

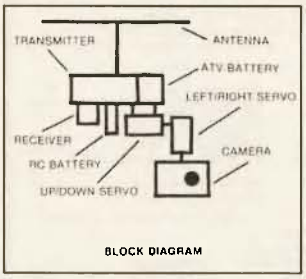

Figure 1. ATV payload configuration.

Photo B. The ATV payload ready for lift-off. (Photo by Jennifer Pifer.)

The Live Camera Kite

After a summer of experimentation, he sent us construction details for his ATV kite with a radio-controlled TV camera. Through use of a two-channel R/C system, he now has control of both the azimuth and elevation of the camera for some spectacular aerial views from as high as 800 feet.

The latest system consists of a Uniden B/W camera, 1 watt P.C. Electronics ATV transmitter, two-channel R/C receiver and servos, a 1 pound gel cell battery and a little wheel antenna (see Figure 1). The "Little Wheel" worked well in the flight tests and is a very lightweight omni-horizontal antenna. It was obtained from *Olde Antenna Lab, 4725 W. Quincy #1014, Denver CO 80236*.

Eric Vermillion, one of the local R/C enthusiasts, fabricated a camera mount out of nylon for the two servos such that one servo is attached directly to the other (Photo C). This provides a very lightweight method of independent Az-El control of the TV camera. The azimuth control has better than 90 degrees of movement, while the elevation servo allows you to view the horizon or to pan smoothly down to point at the crowd directly below the kite. (Whenever you fly a kite this size there usually is a crowd!) The little wheel antenna is mounted on three 12" long plastic or nylon rods to help keep RF out of the camera and the R/C receiver. Using a 1.2 Ah lead acid battery, the payload operates for about 45 minutes.

For best stability, attach four strings about two feet long to the corners of the payload. Tie two of these strings together at each end of the payload. This forms your mounting harness to the flight line. Make two loops about three feet apart in the kite's flight line about 50 feet below the kite itself. Attach each pair of payload mounting strings to these loops. This provides a very stable mount, although you sometimes may experience a gentle swinging motion depending on wind conditions.

Roll Your Own

You can construct your very own monster delta wing kite using the dimensions shown in Figure 2 (The heavy black lines are the support spars). Choose the design width (example: 16 feet). This is your 200% value. This will make the height of your kite exactly eight feet (100% scale). All other dimensions are scaled from this value. It's a good idea to make a paper version of the kite just to be sure of your

Photo C. Close-up view of the servo operated Az/El camera mount.

calculations. The actual kite is constructed from 1.5-ounce nylon material. Allow enough overlap (3") on the edges of the kite and the centerline to make sleeves for the spar supports. The ½" diameter spars are made out of a high strength carbon fiber. They are lightweight and hollow, but can really take a lot of heavy lifting and abuse. The spars can be purchased at kite stores and come in 55" lengths. It will probably be necessary to connect two sections together with a ferrule to achieve the proper size spar. It's a good idea to double stitch those areas of highest stress, such as the horizontal back spar attachment points. The mounting hole on the keel consists of three nylon layers stitched together to provide additional support for flight

Photo D. The ATV package heads for the skies.

line attachment. The horizontal spar mounts in pockets sewed into the back of the kite and helps to form the kite into the proper airfoil shape. All materials are available from stores that specialize in larger kites. While at the kite store, it's a good ideas to take a close look at a commercially built delta wing kite before building yours.

Flight Tips

It's best to use 220-pound kite string. The forces on this large a surface area can be quite strong in a moderate wind. It sometimes takes three people just to bring the thing back in!

A good source of information about kite flying (as well as listings for kite store locations nationwide) is available from a magazine called *American Kite*. They can be reached at *American Kite Company, 480 Clementina St., San Francisco, CA 94103; (415) 896-0830*.

Jon plans to add a 100 milliwatt 10 meter beacon on 28.235 MHz which will be mounted directly on the kite itself. The 10 meter inverted-V antenna will fit nicely inside of the spars. The beacon will be operational during each flight and should prove to be an interesting experiment.

The ATV kite has been a big hit at hamfests and other special happenings. Not only is it a crowd stopper, it's an inexpensive way to provide a bird's-eye view of any event. For more detailed information on the kite system, you may send an SASE to Jon Pifer WM8W, P.O. Box 574, Arlington OH 45814. 73

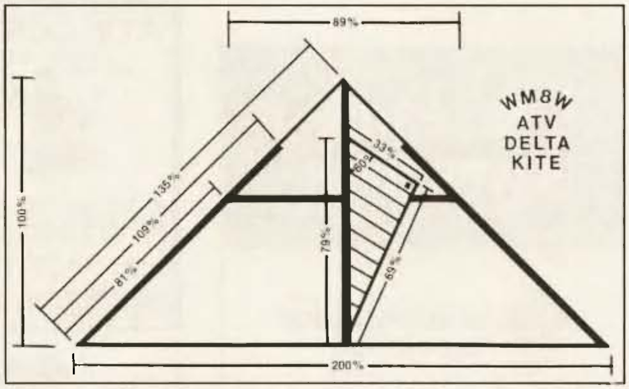

Figure 2. Delta wing kite dimensions.

HAMS WITH CLASS

Carole Perry WB2MGP
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Smarts, Hearts and Sparkle

This fall millions of children all over the country will be going back to school with their new school supplies and their trendy lunch boxes. Along with this, they will also be bringing their fears and anxieties as well as their expectations for the new school year.

The instructor of an after-school ham radio club or a teacher lucky enough to be teaching ham radio in a school, as I do, must take responsibility for making sure that the children in his/her class are highly motivated to learn, and that they feel good about what's happening in that class. Having been on the front lines for over nine years with sixth, seventh and eighth graders in a New York City school, I have come to the conclusion that there are three ingredients which determine whether or not a course will be successful. The three components that teachers must concern themselves with are "smarts, hearts and sparkle."

Smarts

The first ingredient needed for a vital and dynamic ham radio class is "smarts." This refers to the educational validity of the course. Amateur radio in a classroom gives the teacher the opportunity to incorporate all areas of a school's curricula into the daily lessons. While most students are suffering through science, muddling through math and laboring over language arts, children in the amateur radio class are eager and excited about pointing out countries on a map while speaking to a citizen from that country at the same time. The students will be using math skills because of distances, time differences and formulae that are an integral part of radio work. To youngsters in an amateur radio class, this is not just "yucky" schoolwork, it's what we have to do to better enjoy our time on the air.

The teacher of amateur radio must have a flexible approach. You never know who will be getting back to you on the radio. The teacher must be willing to extract the most and the best out of whatever happens. There are built-in social studies and language arts lessons in every contact. It's a bonus if there's a really interesting ham at the other end, and a real treat if it's a live current events happening, like a hurricane or an earthquake, or a contact with an astronaut in space. All the children should leave the classroom ham shack having had new experiences, having learned new skills appropriate to their abilities, and having enjoyed the whole process at the same time. The "smarts" part of a ham radio curriculum is the ability to present material capable of exciting the more "reluctant learners" as well as challenging the "gifted" student.

Photo B. Carole WB2MGP pointing to the flag of a country where the class has made a contact.

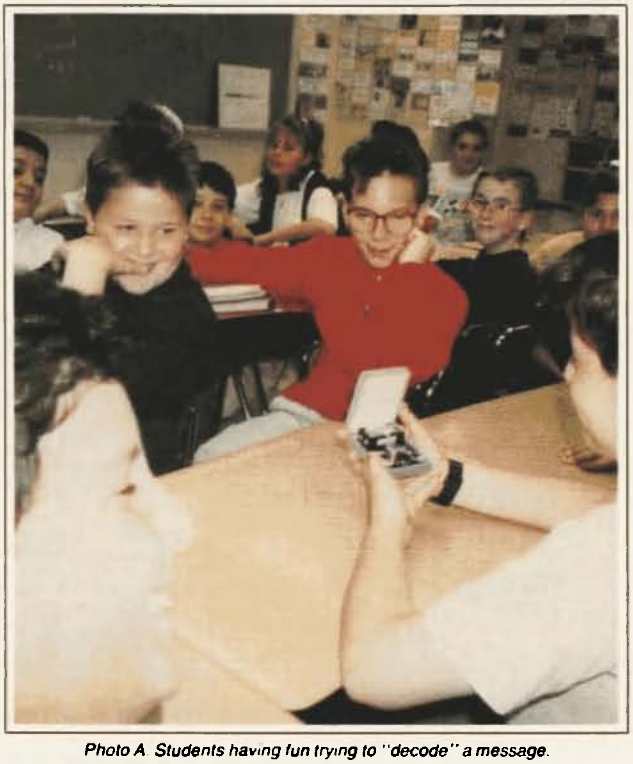

Photo A. Students having fun trying to "decode" a message.

Hearts

The "hearts" component of my magic formula is where the children become motivated to do well because they are made to feel special. Many youngsters in today's society derive almost all of their security and nurturing from their school environment. The "hearts" factor is very important to children with little or no self-esteem, who have really never succeeded at anything else in their school careers. In the ham radio class there is a myriad of skills and abilities a teacher can use to encourage all the youngsters to participate and to contribute on their own levels. Every child should leave that room feeling good about himself. Today's children don't care what we know—they want to know that we care.

Sparkle

"Sparkle" is my favorite ingredient. That's where the instructor makes all the difference in the program. "Sparkle" is that extra-special something that only a creative, dynamic and enthusiastic teacher can bring to a program. It's the smiling face, the accepting tone of voice, the encouragement given, and the establishing of an environment that children want to be a part of while they are learning and having fun.

The combination of a well-trained and enthusiastic teacher of amateur radio, coupled with a supportive administration at school, can only spell success for everyone in the program. The message on this page from my principal, Stanley Katzman, is meant to be encouraging and supportive to all teachers and administrators considering an amateur radio program this year. You can use this column to ask for any help or assistance you may need. Go for it!

As we begin another school year, thoughts of invigorating our curriculum offerings come to the foreground. We are constantly in search of ways in which to infuse enthusiasm, positive attitudes and knowledge to benefit the children in our schools.

From all of those points of view, and many more, the ham radio program at our school fills the bill. Youngsters are literally given "hands-on" experience in communication with remote and varied parts of our continent. They have an opportunity to recognize the universality of concerns over environment, political unrest and ecology. They learn to express themselves succinctly, and with knowledge, so they can better communicate with the voices at the other end of the line. They recognize that we are indeed part of a very small, yet extremely diverse, global community, each of us with similar needs but with varying local problems.

Ham radio, in the hands of a master teacher, incorporates not only the technical skills necessary to operate the apparatus, but also raises the youngsters' awareness and sensitivity to their environment. As school administrators, the task of familiarizing our charges with the basic elements of education is but a small part of our mission. Through this program, the youngsters exposed to the world of ham radio get to recognize the true meaning of cooperation and fellowship. They recognize that there are people, identified only by call numbers, who are willing and ready to help when the need is there, regardless of the miles that separate us.

That is a powerful lesson for young people to learn and, I am pleased to say, one that the students of the Rocco Laurie Intermediate School have been exposed to for many years. Our master teacher, Carole Perry, stresses those elements and continues to bring the message of cooperation and caring to her pupils.

The money and energies expended on creating, nurturing and maintaining a ham radio program pay untold dividends in the development of a student body who is aware and willing to work with people all over the world in bettering the lives of all of us.

Stanley Katzman, Principal
The Rocco Laurie
Intermediate School 72, R.
Staten Island, New York 10314

Number 20 on your Feedback card

ASK KABOOM

The Tech Answer Man

Michael J Geier KB1UM
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A Fork in the Road, and More Blindfolded Painting

Before we begin. I'd like to ask a favor. Please don't call me at home. I have received calls regarding columns and construction projects at all hours of the day and night. Often, long-distance callers leave their numbers on my answering machine and expect a return call. I'd love to answer each one, but I just can't afford it. Could you? If you need to reach me, the best way is via *73*. They will forward all correspondence. Letters of interest to other readers will get mentioned here in the column, but I can't write personal letters back—there's just too much mail. Thanks for your understanding.

Speaking of interesting letters, I just got one today from a young gentleman named Bob in California. No call, last name or return address. He says that he is 18 years old and would like to become an "electronics repairman." His electronics teacher, however, told him that there is no demand for repair people because surface-mount chips have made it too difficult to change parts. The teacher went on to suggest that the students become engineers instead, as the need is much greater for designers. Bob would like to know if this is good advice.

Well, Bob, let me state up front that there is and probably *always* will be plenty of demand for good technicians (the industry term for "repair people"). Remember that for every one designer who creates a product, many repair people will be required to keep the thousands or millions of them working. Yes, surface-mount parts are harder to change, but somebody has to do it. Further, not everything makes use of them. Mostly, they are found in miniaturized gear, such as camcorders, VHF/UHF walkie talkies, portable CD players, etc. The average home VCR doesn't use them, or has only one or two. The same is true for many of the other household gadgets we all take for granted. Of course, that may not always be the case; surface-mount parts will surely be used more and more in years to come. But why be afraid of surface mount? With the right soldering tools, it's really no big deal. And, obviously, no one is going to throw a $1000 camcorder away because a surface-mount chip goes bad, so they must be getting changed, right?

The question of which road to choose goes much deeper. Engineers and technicians do very different things. Engineering concentrates on the theoretical. It involves lots of math and physics. In my experience, most new engineering school grads have hardly touched a transistor or IC. They know lots about Fourier transforms and network analysis, which is very useful stuff. But they have little idea how to use real parts. I guess schools expect them to learn the practical side on the job, and some certainly do. But, as a general rule, engineers spend much more time with a calculator than with a soldering iron, and precious few could fix their own VCR. By the way, engineering pays considerably better than does technician work.

Technicians, on the other hand, are expected to know real circuits very well, but often fall short on the amount of theory they really need to do the job properly. I've met some who barely knew Ohm's law! Others didn't know how to use an oscilloscope, or had little concept of the relationship between the time and frequency domains. Anyway, in the long run it all boils down to this: Do what you enjoy! If you love getting your hands in circuits and, especially, if you really enjoy the thrill of the troubleshooting "hunt," become a technician. If, on the other hand, you get pleasure from mathematics and enjoy devising solutions to new problems, go for the engineering. And remember, you can always do a bit of both. The really good techs are practically engineers, and vice versa. One last piece of advice: Get a ham license. The stuff you'll learn will serve you well no matter which road you choose.

I also got a postcard from Paul W9HD, in which he admonished me to "keep up with the times, OM," because I had wondered whether anybody had put a FAX machine on the air. He explains that the PK-232 does both WEFAX and "ham FAX" real well. Gimme a break, Paul. Even I know there's plenty of computer-type FAX available for the ham bands. I was referring to normal "stick a document in at one end and out pops a copy at the other" office-type FAX. As it turns out, that's been done too. Anyway, Paul, thanks for writing.

Fixing It Without a Schematic

Now, on to our topic. Last month, we were discussing the fine art of schematic-less repair. I use the word "art" deliberately, because the practice just isn't an exact science. You can do everything "right," yet wind up four hours later every bit as confused as when you started. Other times, you may stumble on the answer in five minutes. You just never know.

There are two levels of diagnoses you must make any time you repair something, but their accuracy becomes more critical when you don't have the diagram. The reason is simple: If you get lost, it's a lot harder to find your way back again! Like a crossword puzzle, a circuit can seem very different from what it is if some of the clues are missing.

Level One

The first level is the "macro" level. Look at the radio (or whatever) as a whole and try to decide what might be wrong with it. I've talked about this before, but it bears further thought. Sure, if the power supply is dead, that's a good place to look. In fact, the deader a device is, the easier it probably will be to fix. The toughest repairs are the obscure ones. Perhaps the display flashes on and off, but only now and then. Or maybe the walkie works, but the LOW BATTERY light never comes on when it should. Or the audio is just a little more distorted than it was before. And so on.

In these circumstances, it pays to do a careful job of your detective work. As I've said many times before, rule out as much as you can, starting with the obvious. One trick you can do is to look for conflicts. If the receive audio is poor but transmit is OK, that would suggest that the audio amp might be broken. If, however, the radio uses the same amp for both RX and TX, that's a conflict. Many inexperienced techs will overlook the conflict in their desire to make the diagnosis. Naturally, that diagnosis will turn out to be wrong. As a general rule, if there is a conflict, you are probably looking in the wrong place. As the proverb says, if the puzzle won't fit together, there's probably a piece missing!

Before I get to level two, I'd like to make a special case of the example in the previous paragraph, in which the display flashes on and off, but only occasionally. If you ever want to give a tech nightmares, whisper the ugly word "intermittent." Ugh, I felt a stomach pain just typing it! Nothing but nothing induces frustration like an intermittent. It never acts up when you want it to, and you almost never can be sure you've really fixed it.

The worst offenders are cold solder joints on PC boards. It seems like, no matter where you tap the board, the effect is the same. In fact, sometimes the problem seems worse when you tap on the board far from the actual bad connection. I have never found any foolproof, or even reasonable, way to attack this sort of trouble: you just have to keep trying. By the way, circuits which act up only after the rig gets hot are usually not true intermittents. Thermals are best found with a can of freezing spray. Let the rig act up, and then spray suspected areas until it calms down again. Concentrate on transistors and ICs—they are nearly always the culprits. When you think you've found the trouble, go through the heating/cooling cycle again just to be sure. On rare occasions, I've seen cold solder joints behave in a thermal manner, so I always check the connections before I change the part.

Level Two

I've digressed a bit, so let's get back to the non-intermittent diagnosis process. Last month we discussed how to recognize various stages. Once you've decided to concentrate upon a particular stage, how do you find its inputs and outputs and start troubleshooting? Let's look again at the various stages, this time delving into their innards.

Power supply regulator: If it's a transistor in a linear regulator, you should find a zener diode near the base. I say "near" because there could be some resistors in between the two. Check that the voltage appearing on the zener is whatever is specified for that type of zener. Look the part up by its part number. If, for example, it's a 9-volt zener, you should find about 9 volts across it. Don't worry about small fractions of a volt, but if it reads significantly *more* than 9 volts, it is open and should be replaced. If there's *less* than the rated voltage, the diode may be OK, and simply may not be getting enough voltage from the rest of the circuit.

One end of the transistor, either the emitter or the collector, connects to the output of the rectifier/filter area, and the other end goes to the final filters and then feeds the rig. Measure the two voltages with respect to ground. If they are the same or nearly so, the transistor is most likely shorted. If there's at least 0.7 volts difference, the transistor may be OK. Here's an easy way to tell: Kill power, disconnect the base and connect it to the emitter. Now turn it back on. If the output disappears, the transistor is not shorted, and is probably OK.

If there's no output at all to begin with, check that there's voltage at the input of the transistor. If there is, and the base has something on it, too, then the transistor is very likely open.

IC regulators are a bit trickier, but they are just collections of transistors, after all. There will still be an input and an output, with some sort of feedback from the output to an "adjust" terminal, which corresponds to the base of the transistor in the discrete version. Troubleshoot them the same way.

Switching regulators, which aren't common in radio equipment, are distinguished by pulses at the transistor base or on one of the IC pins. In a previous column, I discussed them in some detail. Switching regulators in otherwise linear supplies are OK to work on, but try to stay away from full switching power supplies unless you have an isolation transformer and really know what you're doing. They are just too dangerous to poke around in because much of the circuitry is connected directly to good ol' deadly AC wall power.

In my June column I made the erroneous statement that a variac could be used to isolate the AC line. As pointed out by Ted WA2RGB, a variac does not provide isolation from the AC line and should never be used for that purpose. Thanks Ted for the info.

Yikes, I just noticed I'm out of room again, so we'll have to continue this next month. See you all then.

Number 39 on your Feedback card

QRP

Low Power Operation

Mike Bryce WB8VGE
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Massillon OH 44646

Improving the VFO

Last month I described one of my personal favorites, a VFO. I've been using this circuit for a very long time, with excellent results. However, there is always room for improvement. This month we'll take a look at the modifications I made to the circuit.

Since the VFO operates as long as the supply voltage is connected, using the VFO in a transmitter could cause trouble. You would "hear" the VFO on the receiver, which would mask out all but the strongest signals. Of course, this is not what we want. To be a happy camper, we need to move the VFO's signal out of the range of hearing.

There are several ways to do this. First, we could just remove the 12 volts from the VFO. But this could cause the VFO to drift from short-term instability. Second, run the VFO at a different frequency altogether. Too much trouble. Or we could just shift the VFO's frequency out of the way—by far the best bet.

Shifting Frequency

To shift the VFO we can either add capacitance or inductance. Either one has the same effect; the frequency of the VFO is lowered. Take a look at Figure 1. This simple circuit will lower the frequency of the VFO by adding a small amount of capacitance to the tuned circuits.

As the figure shows, C4 is a piston-variable trimmer capacitor. I chose this type of capacitor because they're cheap, easy to come by, and very stable.

Here's how it works. When the VFO is operating normally, C4 is out of the circuit; everything operates normally. When the offset line is turned on by the application of 12 volts, D1 is turned on. This connects C4 to the tuned circuits of the VFO, adding capacitance, thus *lowering* the VFO's frequency. The choke keeps RF out of the offset circuitry and other switching systems. Now why use a trimmer capacitor, besides the above reasons? Well, for one thing, you don't have to use one if your VFO is only for a transmitter. Just replace the trimmer capacitor with a fixed capacitor of small value, such as 4.7 pF. You don't want to add too much; it might cause the oscillator to stop.

As for the trimmer, when you're building a matching direct conversion receiver for the transmitter, you can use the free-running VFO. In fact, you'll need the VFO for injection to the mixer. By using a variable trimmer capacitor, you can do a little bit of magic: transmit offset.

Fine Improvements

When the T/R controls switch over from receive to transmit, the capacitor will again switch into the tuned circuits. By adjusting this capacitor, we can produce a 750 Hz offset, just right to keep from leap-frogging across the band.

We can also make the VFO a little better by removing the zener diode and replacing it with an outboard regulator. This simple regulator circuit, shown in Figure 2, must be installed away from the VFO. We don't want the heat generated by the IC to affect the frequency-controlling components of the VFO.

To help clamp the RF voltage and secure stability, add a 1N914 diode across the 39k resistor on the gate of the 2N3819.

The entire VFO *must* be shielded. Use double-sided PC board if necessary. It might not look too good, but it does work. Since there is no PC board for the offset circuity, I used a small piece of perfboard, mounting it as close as I could to the main VFO board. Be sure to pot the entire perfboard with silicon sealer, as this will keep microphonics to a minimum.

Use feed-through capacitors for the offset control lines and for +Vcc to the VFO. Shielded cable for the output is also a good idea. If you don't like messing around with the RG-174/U cable, shielded microphone cable works quite well and it's a lot easier to work with. Radio Shack sells a roll for a couple of bucks. Another good source for this cable is old audio patch cords. I always have a pile of cables with a bad end. Cut the ends off, and you've got a good start on some fine shielded cable.

Now that most of the electronics of the VFO have been built, here are a few thoughts on the mechanical side. The difference between rock-solid tones and a warbler can be traced back to mechanical construction.

Housing, Drives, and Calibration

I prefer to use a small aluminum box to hold the VFO. This box provides both shielding and structural support. Also, it's much easier to mount feed-through capacitors. And, unlike PC board shielding, I can always open the aluminum box to fix whatever might go wrong. PC shield boxes can be a real bear to get apart. Photo A gives an inside view of the VFO and the offset circuit. Notice the amount of RTV sealer on the toroid.

This brings us to the last problem with home-brewed VFOs: How do you get that velvet smooth tuning of commercial rigs? Well, you don't. It's that simple. You can come close, but you'll never get the feel of a TS-440 from a home-brew rig—unless you have lots and lots of money to play with.

A vernier drive is a must. In fact, it's common practice to use TWO vernier drives, one to turn the other. This allows for very fine tuning, but at a cost. You can't move quickly from one end of the band to the other. Jackson Brothers make the finest drives around, but they're not cheap. The imported vernier drives never seemed to hold up for me. And they always made my home-brewed projects look, well, home-brewed! Regardless, get the best drive you can.

Calibration is another problem with a home-brew VFO. How do you know where you are? In my case, I don't really care. I just adjust the VFO for the band I'm working and leave it there. I adjust the very low end for, say, 7.025 MHz and let it go at that. When I tune up the band and I hear RTTY, I have a good idea I'm near 7.080. When the CW slows down, I'm in Novice country. On hearing SSB from the speaker, guess what? I'm in the phone bands. Now, of course, this really plays havoc when you're in QSO with a guy who asks you to QSY up 2 kHz. You call me! A 100 kHz calibrator with outputs at every 25 kHz works well, too. You'll know you're at least 25 kHz close to something!

Instead of my method of dial calibration, you can use a digital readout from a frequency counter. However, this spoils portability unless you have a very small frequency counter.

The problem with VFO calibration is linearity. The capacitor we use for tuning the VFO is not linear from one end to the other; that is, the changes in capacitance are not linear as you move the capacitor through its range. You might end up with more capacitance on one end than on the other. The same thing happens with inductors. Some of the frequency spread will be on one end of the dial, while on the other end, it's all jammed together. A perfect example of this occurs in the old Alda radios. On the 80 meter band, the CW portion had wide gaps between the dial markers. Moving toward the higher end, frequencies were piled on top of each other. Instead of fixing the problem, Alda changed the symptom. They re-marked their dial to compensate for the nonlinearity of the VFO.

There are two fixes for this problem. One, you can tune the inductor and not the capacitor. By changing the pitch of the windings, you can fool the tuned circuits into thinking they're linear. Called "permeability tuning," this is the most common method used in analog VFOs. An older method required changing the shape of the rotor plates of the tuning capacitor. You don't see this done today, but you can find examples in the older shortwave receivers.

Next month we'll look at some VXO circuits. I also have a special treat for the QRP builders out there. Hint: think small.

Before I call it a day, this issue marks the third year for the "QRP" column. I want to thank all of you who have written me your comments and thoughts. You're always welcome. As I said in the first issue way back in October 1987, this is your column, dedicated to the low-power enthusiast.

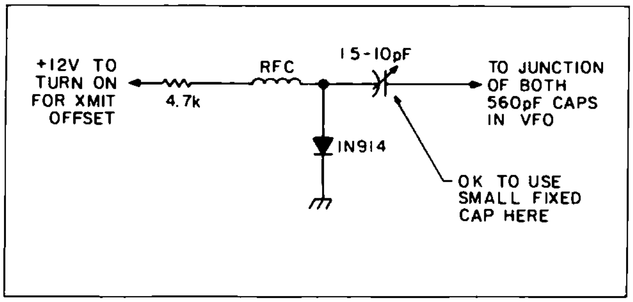

Figure 1. This circuit adds a small amount of capacitance to the tuned circuits, thereby lowering the VFO's frequency.

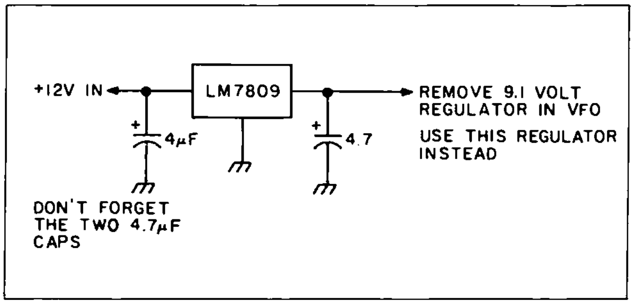

Figure 2. Remove the zener diode and install this simple regulator circuit.

Number 21 on your Feedback card

Looking West

Bill Pasternak WA6ITF
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The Greatest Day of My Life!

I have just returned from the most delightful afternoon of my life. I was at a wedding. A wedding so totally filled with the aura of love that all of us in the church could feel it and share in it. The bride and groom have known one another for less than a year, but in all of my 48 years I have never seen two people who more fit the old adage, "made for one another."

Why write about a wedding in a ham radio magazine? Well, the simple truth is that one of the newlyweds is a ham, and, if you have ever seen the ARRL video titled "The New World of Amateur Radio," then she is someone many of you already know. Her name is—or should I say that her name was—Kelly Howard and at age 19 she has become the bride of Mr. Steven Lenherl.

Kelly entered my life about four years ago when I was co-producing the aforementioned ARRL video. We were looking for some youngsters with ham tickets to co-host the show with Roy Neal K6DUE and one of those suggested was a fifteen-year-old from San Diego, California, with a General Class ticket and the callsign N6PNY. I quickly became friends with both Kelly and her mother Patty N6LKC. In 1988 Kelly began making the rounds at some of the local ham conventions on my panel sessions to speak about young people in ham radio. In February of 1989 Kelly came with Roy Neal K6DUE, Frosty Oden N6ENV and myself to tape interviews with U.S. Senator Barry M. Goldwater K7UGA. Roy did the one on Goldwater's views on code-free licensing, but it was Kelly who was able to show Barry Goldwater as the ham who truly loved young people and was willing to advise them.

You have probably never seen that interview. It became the pilot for an educational series that Kelly and I were thinking of, but which never got enough funding to get off the ground. We called it "Today's People—An Interview with Barry Goldwater." Kelly co-wrote it and co-edited with me—the latter on a rented Betacam edit system on my living room rug! It's really good to show youngsters in a classroom or maybe in recruitment sessions for young hams. Maybe one of these days I'll run an ad and make copies available on VHS, but for now it sits in my collection of completed video projects awaiting further action.

In the spring of '89, after she graduated from high school, my wife Sharon invited Kelly to come and live with us. She was with us for about six months during which time we taped a second "Today's People" which we subtitled "Mr. Umpire." It was a one-on-one interview with a former major league umpire named Al Kaplon. Kelly, who knew almost nothing about baseball, was so able to get in-touch with Al's feelings while on camera that Al later confided in me that Kelly was a far better interviewer than most of the full-time professionals on whose shows he had guested. Kelly was with us until about the first of this year when she got her first apartment and moved out on her own. It was at about this time that she joined the First Assembly of God Church of Burbank, and it was there that she met the man who would become her mate for life this past July 28.

I have to tell you that it was possibly the most emotional moment of my life as I watched Steve and Kelly vow eternal love for one another. I was awestruck as I listened to Steve sing a special song of love to his new wife as they stood hand-in-hand at the church altar. Then followed their receiving first Holy Communion as man and wife. The beauty of these few precious moments will remain with me until the end of time.

So, why write about this wedding here in *73*? After all, it's barely a ham radio related story. But you have to understand that I never was blessed with children of my own and I honestly feel as if Kelly was for me the daughter I never had. And maybe these are the words of a very proud "want to be father" who wants to share this joy with you—especially the "you" who became hams after seeing Kelly at age 16 explain our magical world that we call "The New World of Amateur Radio." At 19, Kelly, the young woman who I at times joked as being my "honorary daughter," was truly a beautiful bride!

Tom McMillan WB3HGW, the Man Who Got Waivers for the Handicapped

In June, radio amateurs in the United States learned that intercession by His Majesty King Hussein JY1 had lead to pressure from the White House to change the Part 97 regulations regarding the administration of Morse code examinations to handicapped applicants.

Specifically, the Commission has modified Part 97 to permit waiving Morse code tests for handicapped persons wanting to upgrade from Novice or Technician to General, Advanced or Extra class. The FCC has also directed those administering Novice exams to handicapped applicants to make special provisions in the testing process to include permitting a handicapped person to copy the 5 word per minute test one phrase, sentence or word at a time.

This change is basically the result of efforts by a Pennsylvania amateur who has tried to upgrade for almost a decade, but who suffers from a malady that keeps him from copying code at speeds greater then 5 words per minute. When Tom McMillan WB3HGW wrote to JY1 asking him to intercede he had no way of knowing the impact that his letter would have. He was as surprised as anyone, as you will read in the one-on-one interview that follows.

Newsline: Tom, how was it you took on trying to obtain the waiver system for the handicapped?

McMillan: I was originally licensed in 1975. Through the years I have practiced and practiced to try to get it [an upgrade] and just could not. I even went to a couple of neurologists, one of whom was an amateur and I was told that I probably would not ever be able to copy code at different speeds.

But I have always been the type [of person] that, when you told me that I could not do something I worked harder to accomplish it. But, it just came to the point that I had to admit to myself that I was never going to get to 13 words per minute.

Newsline: Why is that?

McMillan: I have epilepsy, and as the doctor stated in his letter to the FCC, the medication that I am on slows the brain action down even slower. So, my doctor wrote the letter to the FCC.

Newsline: And what happened then?

McMillan: It was sometime in 1988 that I presented the letter to the FCC, but they were pretty staunch in their position of not granting exemptions. In fact, I never even heard from them at that time. [Even after] letters that were written on my behalf from a VE here in Johnstown, and my letters to the ARRL, all they did was send me a letter saying that they had turned it over to the Courage Handi-Hams, who, in their letter, said that they were sure that they could teach me the code somehow so that I could pass the test.

But, like I have been telling the FCC for years, it is not the test that is given, but, rather, the speed. The epilepsy and the amount of brain damage I have just will not allow me to copy it at a faster speed.

Newsline: Did you then contact the Handi-Hams?

McMillan: Not really. They are a truly good organization, but I knew that no matter what they presented as the test, I could not pass it. I had already tried everything that anybody had ever suggested and probably more. At that point I wrote to King Hussein. That was back in September of 1989.

Newsline: Why go to someone outside the United States?

McMillan: Well, it seemed as if everything I had tried here in the United States didn't work. I talked to the FCC on the phone. I got one call from the FCC on the phone. I forget exactly who it was from, but he said that under no circumstances would the FCC ever grant a waiver on the code.

Like I said, I probably tried just about every route I could think of in the states. One night I was lying here trying to think of what else I could do and so I wrote to King Hussein.

Newsline: What happened from that point?

McMillan: That was on September 4, of 1989. He replied with a letter. His 'Royal Communicator' signed the first one that I received and it said that he did write a letter to President Bush and that he [Hussein] felt that something could be done. In the first part of February of this year I wrote to King Hussein again and he replied and said that he had written to President Bush and that President Bush had assured him that there would be some way that they [the government] could help.

Newsline: Did you expect action or did you feel you were being placated?

McMillan: I had heard stories through the years that King Hussein has helped other amateurs in various ways and that's why I wrote to him.

Newsline: Then, were you surprised to hear from him?

McMillan: I figured that he would respond. Most people in those cases would because it is good will between the two countries. He is an amateur and every so often he does go on 20 meters, although I haven't talked to him. I talked to one person in the Royal Palace in 1988 on 10 meters, but I have never spoken with the king himself.

Newsline: Obviously it had some impact.

Mc Millan: Well, President Bush—I don't know if he gave the letter to the State Department, but I assumed he turned King Hussein's letter over to them and requested intervention on my part. The State Department and the National Security Agency were involved.

Newsline: Did they contact the FCC?

McMillan: What they did was go to the FCC board [commissioners] and they had to get the approval of the five members in order to grant the waivers, so they have actually changed the law.

Newsline: You were hoping for an exemption for yourself. Did you expect it to be across the board for all of the handicapped?

McMillan: In my letters I stated that I hoped they would not treat it as a single issue because different people with different handicaps certainly could offer good radio service to various groups and handle a lot of different types of communications. So, I was glad to see that it was not treated as an isolated case. They were changing the laws, not only here in the states, but also internationally.

Newsline: Playing devil's advocate for a moment, what's to keep someone now from going to King Hussein, or Barry Goldwater, and saying that ". . . the FCC is willing to waive the code test, but I can pass the code but not the theory . . ."? What about theory test waivers?

McMillan: Unfortunately, I did open up a big can of worms, and it is an area where the FCC and its counterparts throughout the world are unfortunately going to have to deal with the situation.

The thing here is that anyone who can read should be able to pass a written test, but where my argument was in

regard to exemption from the code was the brain damage that I have. It cannot be repaired. No matter what technique is used, there is no way to increase the speed of my brain processing it.

Newsline: What about CW?

McMillan: I actually believe that there should be a code requirement and I am against them [FCC] dropping the code as a requirement!

Newsline: Are you proud of the fact that you have been able to help other handicapped people in this way?

McMillan: Yes. I have been disabled since 1973. I was originally hurt in a coal mine. I had my back broken and my spinal cord severed and I have suffered from epilepsy since I was two years old. So, I don't mind fighting for someone's rights whether it is popular or unpopular. I believe that I was being discriminated against because of my disability and I figured that I would fight it. Luckily enough I won, and I am proud that I am the first one to get it done. It is really a shame that I had to go outside of the country to someone like King Hussein, but that was just one more avenue I had to try. And, it worked.

Newsline: Is upgrading next for you?

McMillan: I would like to eventually get my Extra Class license. I have the applications and everything here to join MARS. I have a son in the Navy and a nephew in the Army, so once I get my General class license I will join the MARS net.

Newsline: I understand you are already a net control station and have been honored by your radio club.

McMillan: In April of 1988, the Hilltop Repeater Association honored me with a plaque for dedication as a control operator on our Sunday evening net. I ran the net for about two-and-a-half years, and I have been a [repeater] control operator for about the same amount of time.

Newsline: Earlier you said you favor a code requirement. What do you think about the proposed no-code license?

"McMillan: I actually believe that there should be a code requirement . . ."

McMillan: Anybody with any intelligence should be able to pass the test at 5 words per minute. So, I can't see them [the FCC] granting a waiver from the code on this codeless license while giving them all the privileges of a Novice and a Technician class license in voice.

If they go with a codeless license, meaning totally codeless and including 10 meter voice privileges, they will create a big problem with people who have run CB for years—run power and run it illegally—because it'll make it easier for them to get a Novice or Technician class license.

It is hard to say what the FCC is doing. You don't know for sure because you get too many interpetations. I guess we are really going to have to wait till they come down to it in the last draft.

FLASH: As we are completing this article on Friday, July 13, the United States Senate passed and sent on to the president for his signature the omnibus "Americans in Disabilities Act of 1990." The house of Representatives had previously passed an almost identical bill and President Bush has promised to sign it into law as soon as it arrives on his White House office desk. The bill directs the public and private sectors to make sweeping accommodations for the nation's several million disabled citizens, and does this with the force of federal law. Peyton Moncure, another individual who has been a moving force behind abolishing all Morse code testing for handicapped applicants for amateur radio licenses, has vowed to use the terms of the act in court to achieve this goal before the end of 1990. My friend Steve Bauer KC0HF, himself visually handicapped, interviewed Peyton Moncure for the pre-net audio for the July 22nd No-Code National Teleconference radio net. With the next move in this story really up to Moncure, I have decided to continue this series and will bring you that interview next month.

Richard Burton—Chapter Two

As we noted in our last column, former ham Richard Burton was arrested last spring and charged with three counts of operating a radio transmitter without a license. This was not Burton's first brush with the FCC over ham radio matters. He had his license lifted almost a decade ago over other regulatory violations. He was eventually charged with a misdemeanor of operating without a license when he refused to go off the air after receiving an FCC order to do so. He served seven months in prison and several years on probation. According to the FCC, he apparently didn't learn his lesson.

As we said, Burton was arrested again last spring, but this time the charges were of a felony nature. Burton protested his innocence, but the evidence was apparently overwhelming against him on one count of the indictment. At 1:52 PDT on July 20, 1990 a jury sitting in federal court in Los Angeles convicted Richard Burton of one count of operating a radio transmitter without a license. The former WB6JAC now faces a possible fine of up to $100,000 and/or up to two years in federal detention. Sentencing is scheduled for October 1. 73

Above and Below 2 Meters

Know what you're hearing.

by Chuck Gysi N2DUP

If you've bought a new 2 meter rig in the past couple of years, chances are the radio has more capability than you realize. While you're driving down the interstate ragchewing with the gang on the repeater, it might pay to check out the action on the rest of the VHF spectrum your radio can receive.

What Are You Missing?

Almost all new 2 meter mobile and hand-held radios are capable of tuning in the 138-144 and 148-174 MHz bands above and below the 2 meter amateur allocations. But unless you have an idea of what lurks beyond the boundaries of our beloved 2 meter band, you may not know what you're stumbling on. Any ham with a 2 meter rig that can tune in 138-174 MHz can eavesdrop on a host of radio users, including the local police, fire departments, the military, tow trucks (after making the patch, make sure the hook's en route), mobile phones, marine channels, the FBI, the Secret Service, and even the good ol' FCC.

We'll take a look at the spectrum surrounding 2 meters and see what you might tune into the next time someone's making a long-winded phone patch while you're sitting in rush hour traffic. Commercial users usually have 15 kHz spacing between channels, while the federal government most often uses 12.5 or 25 kHz channel spacing.

Military Bands

First of all, the 138-144 and 148-150 MHz bands are used almost exclusively by the military. If you can scan down to the 136-138 MHz band, you might stumble across some satellites sending weather pictures and the like back to earth. Types of military activities you can hear would be military police, security police, war games, medical units, firecrash crews, fueling operations, phone patches by the brass, etc. In fact, you'll probably hear MARS operations just above and below 2 meters, which you can recognize by the distinguished callsigns MARS stations use.

Several Navy and Marine Corps installations use 140.100 as a crash net frequency. In addition, the next time someone accidentally sets off an emergency locating transmitter (ELT) beacon in their garage on 121.500, you'll probably hear Civil Air Patrol units DFing the signal on 148.150 (repeater output) or 143.900, the repeater's input frequency.

Photo A. Nearly 100 portable pack sets are in service at the Santa Fe Railway's computerized car classification yard at Barstow. (Courtesy of the Santa Fe Railway.)

Mir Downlink

One popular frequency you should definitely give a listen for is 143.625, the downlink frequency cosmonauts use aboard the Soviet *Mir* orbiting space station. You can hear the cosmonauts easily with a handheld if they are communicating with a ground station while passing within range of North America.

On the Road Frequencies

From the military bands, we move right along where you'll find tow trucks and auto clubs in a band of 11 frequencies from 150.815 to 150.965. Then there are 10 frequencies from 150.995 to 151.130 used for highway maintenance. This can range from your town's road department to maintenance and highway patrol units on toll roads. Forestry conversation channels, used by park rangers, fish and game wardens, environmental quality and response units, and marine police, can be found from 151.145 to 151.475.

Large-scale construction firms as well as farming use a band from 151.490 to 151.595. The frequency of 151.505 is reserved for itinerant use and might be heard on job sites. Another itinerant frequency, 151.625, is a catch-all channel for businesses, especially those that move about from city to city.

Mobile Phone, Construction and Movie Crews

Although the Electronic Communications Privacy Act prohibits the actual monitoring of voice paging and mobile telephone calls, who's to tell if you stumble across such communications in the 152.030 to 152.240 and 152.510 to 152.840 bands? In between, you can hear taxi dispatchers on 152.270 to 152.450 (with the cabs transmitting on 157.530 to 157.710).

Frequencies from 152.870 to 153.725 are used by motion picture crews, heavy construction (including fuel oil delivery), manufacturers, logging and paper mills, petroleum production, and power and water utilities.

The "Public Safety Band"

The police, fire department, ambulances, hospitals, veterinarians, school buses and other municipal services, use the 153.740 to 156.030 band. Some channels can be used by any local government, while others are allocated specifically for police or fire communications. A few business band channels are tucked in here, too, from 154.515 to 154.625. Two such channels, 154.570 and 154.600 are low-power, 2 watt channels for business and other purposes, including the order boards for drive-throughs at McDonalds across the country. The next time you drive through for a Big Mac, you can listen to yourself order.

Police Emergency Channel

Another frequency of note is 155.475, the nationwide police emergency channel typically used for mutual aid.

You'll find more highway maintenance channels from 156.045 to 156.240. There is no standard for repeater pairs for commercial users. Thus, a 156 MHz channel may be used as a repeater input in one area, while the same frequency may be used as an output somewhere else. It is not uncommon for repeaters to bring up other repeaters if the same CTCSS tones are in use.

Marine Band

The marine band runs from 156.275 to 157.425. Channel 16, 156.800, is the distress and calling frequency, while the Coast Guard uses 157.050 to 157.175. You can hear telephone calls from marine users on the output frequencies of 161.800 to 162.000. Typically one or two channels are assigned to a given area. Vessels are paged for phone calls on 156.800.

Utilities, Heavy Construction, and Industry

Some more tow truck channels run from 157.470 to 157.515, while water and power

utilities use 158.130 to 158.265. Manufacturers, heavy construction, forest products, and petroleum production use up 158.280 to 158.445.

Police and local government channels as well as highway maintenance frequencies run from 158.730 to 159.210, with forestry conservation and environmental units operating from 159.225 to 159.465.

Trucking companies and armored cars use 159.495 to 160.200. And if you're a railroad buff, try tuning in 160.215 to 161.565. Here you'll find road and yard channels as well as talking hotbox detectors and railroad police. If it's on the rails, it's using radios.

News and TV

And if you want to keep on top of what your favorite TV or radio station is up to, try tuning in 161.640 to 161.760. This is where you'll find live remotes, traffic helicopters, news crews, and cues to reporters. Additional frequencies include 166.250 and 170.150, except within a 150 mile radius of New York City, where they're used for fire departments.

If you want to hear what your local newspaper is up to or where your newspaper carrier is, try 173.225 to 173.375. Some water and power utility frequencies fall between the newspaper frequencies.

Federal Directory

Last is a band of intrigue, the 162–174 MHz federal band. Here you'll find secret agents, the military, park rangers, investigators, and tax collectors. Here's a look at how the band is roughly broken up for various agencies:

FBI— 162.6375 to 162.7875, repeater outputs; 163.825 to 164.550, repeater outputs; 167.150 to 167.7875, repeater inputs and simplex operations. Every FBI field office uses 167.5625 as Channel 4 on a nationwide basis for coordination. The static you may hear on these channels is Digital Voice Protection scrambling.

Secret Service— While this agency is charged with dignitary protection, they also chase counterfeiters. Try the following popular frequencies: 165.7875, Channel Baker; 165.375, Charlie, command post channel; 165.2125, Mike; 167.025, November, White House Advance Team secondary; 164.8875, Oscar, motorcades; 164.400, Papa, counterfeit operations; 166.700, Quebec, White House staff; 166.5125, Sierra, presidential protection, White House Advance Team primary; 164.650, Tango; 166.4625, X-ray, Treasury Department common channel; 162.6875, Yankee, on-site phone patch input; and 171.2875, Zulu, on-site phone patch output. Code names are used by agents to refer to protectees, i.e., Reagan was "Rawhide" while Bush is "Timberwolf."

FCC— The Federal Communications Commission uses 167.050 as a repeater output (input on 172.800) nationwide, as well as for simplex communications. This is a fun one to keep an ear on. But if you hear units on the input frequency, watch out!

Customs— Check 165.2375 and 165.4625 at ports and airports.

Bureau of Alcohol, Tobacco and Firearms — This catch-all agency deals with smugglers and can be heard on the following channels: 165.2875, 166.5375, 166.4625 (Treasury common) and 165.9125.

US Marshal's Service— Check out 163.200, 164.600, and 162.7125.

IRS— Got taxes due? Keep an ear on 165.950 for criminal investigations. In addition, 166.000 and 167.100 arc used for internal affairs.

Immigration and Naturalization Service— These units not only keep an eye on the border, they also roam cities looking for illegal aliens. Listen to 162.825 and 163.625 to 163.675.

General Services Administration— This agency primarily uses radios for protective details in federal buildings. VHF channels include those from 163.0625 to 163.175.

US Army Corps of Engineers— Whether designing a dam or rerouting a stream, the Corps uses 163.4125 and 163.4375.

Federal prisons— Guards use 170.875 and 170.975.

Military— You can hear operations on the following bands: 163.4625 to 163.600, 164.000 to 164.200, 164.500 to 164.600, 165.000 to 165.1875, and 173.4125 to 173.5875. Army, Air Force, Navy, Marine Corps, and Coast Guard units use these frequencies.

National parks— Rangers and support staff use the following: 164.4125 to 164.475, 164.725 to 164.800, 165.000 to 165.1875, 166.325 to 166.350, and 166.725 to 166.975.

Coast Guard— While 165.2625 is used for communications, you can hear marine Channel 16 links on 165.3125 and 171.3375. Channel 16 is the input and the Coast Guard frequency repeats every thing it hears on the channel.

Environmental Protection Agency— You can hear EPA staffers and helicopters on 165.4125.

Federal Aviation Administration— FAA units use 169.250 to 169.375. Also of note is 165.750, which National Transportation Safety Board air crash investigators use.

Postal Service— You can hear postal trucks and investigators on various frequencies in the 164, 169, and 170 MHz ranges.

While this list for federal agencies is not meant to be inclusive, it is a basic look at how the US government divvies up its share of the spectrum.

Scanner directories are a good source of information for finding additional frequencies that may be within range of your 2 meter rig's receive capability. And don't forget to keep an eye in the rearview mirror while you monitor those top-secret agents as they close in on their target. ■

You can reach Chuck Gysi N2DUP at Scan Communications Co., P.O. Box 974, Burlington IA 52601-0974.

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ABOVE AND BEYOND

VHF and Above Operation

C.L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake
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The 100 MHz Overtone Oscillator

Last month I covered a temperature control circuit that could be used for a crystal oven control circuit. This month the topic is a crystal oscillator circuit I used in conjunction with the temperature control circuit. The circuits were built to supply a reference frequency for control of a 6 GHz microwave brick oscillator. The bricks normally require an oscillator in the 90 to 108 MHz range, with some tolerances for off-frequency operation. The oscillator circuit shown here will work from 90 to 110 MHz, and you can use it with any brick that requires an external oscillator.

Brick oscillators normally come with an internal crystal circuit, but recent surplus items do not have this feature. I picked up quite a few brand-new 6 GHz bricks, and presume others did as well. Additionally, I have just received some information about a large quantity of surplus high power (10W) 6 GHz equipment, and I've written for details. I'll pass them on as soon as I receive them. It's possible that the circuits might be adaptable to, or even describe part of, the system.

The schematic diagram of a standard internal oscillator was developed by reverse engineering. While other circuits are available that would work, we want one circuit and one set of specifications for a standard crystal. Crystals could then be ordered from multiple sources, making reproducibility and frequency tolerances as close as possible. By eliminating the wobble in the main wheel, we can hold frequency tolerances and stability to an acceptable level. The International Crystal Co. specification is #585132 for a MS-54XOL (Frequency West) type of brick oscillator.

Temperature Control

The oscillator is constructed on a postage-stamp size PC board. Consulting the parts layout, I drilled and reamed all holes for direct connection. I didn't have time to put a circuit board together for this project. See Figure 1, the suggested layout. The small size of the circuit was not done to get you to work with microminiature parts, but to minimize the effects of temperature. The smaller the mass of the box, the easier it is to control the temperature. I searched for a suitable small container and could not find anything I deemed acceptable until I noticed that a short section of waveguide could enclose the entire oscillator circuit.

Each end of the waveguide is closed off with a plate of scrap brass. On one end, I soldered the plate to the waveguide, closing it off. Carefully holding it in position, I attached the other end to the PC board by the component leads. See the construction details in Figure 2. I slid the oscillator into the waveguide, with a small piece of Mylar™ as insulation to prevent shorts. I didn't solder the power feed end of the waveguide; the circuit itself makes a close fit. Also, covering the entire assembly with a layer of styrofoam holds the unit together and gives excellent thermal insulation to the heater circuit. Three connections are mounted on the end plate: 1. DC power, 2. capacitance adjustment, and 3. coax RF out. Leads run out through the foam insulation.

The crystal oscillator, being small, is supported quite well, even rigidly, by the component leads. Usually the circuits I construct are quite large, to accommodate surplus and junk box components. This oscillator is the exception. But don't get me wrong; this is not the only possible arrangement of parts. The prototype was much larger and it worked well. You can change the layout if you wish. Just keep the crystal leads reasonably short, and the modifications should be just fine.

Transistors, Resistors, and Coils

The transistors I used were 2N930 (NPN), but you can use any good UHF type. If you plan to enclose the oscillator in a waveguide oven, you will need a T0-18 case to fit the PC board. This is a small metal-cased transistor about 3/16-inch in diameter. The other components are standard ¼-watt resistors and a mixture of mica and CK-05 ceramic capacitors. The RF chokes were home-brewed using 1 megohm, ¼-watt resistors for the RFC forms. Any high value will do. They showed a good *Q*, about 35 as I recall.

Don't use the inexpensive, imported resistors for the RFCs, since they don't have a flat tubular design. They will work, but winding the coil over a curved surface is a little tough. Use standard ¼-watt symmetrical tubular resistors. See Figure 3 for details.

The three inductors: 0.1, 0.39, and 0.47uH RF chokes, are wound with #36 enameled wire. The 0.1 uH choke required 6 turns spaced about half a wire-diameter apart. The remaining coils were wound unspaced, with tight turns. The 0.39 uH required 15 turns, and the 0.47 uH choke, 18 turns. I adjusted the turn spacing slightly while using a *Q* meter to set the inductance on the mark. But this step is not essential, as the values came out quite close to my first measurements.

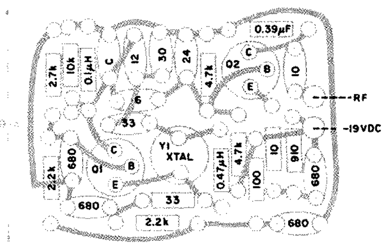


Figure 1. Parts placement. Larger scale (2.5 size) for test setup; 100 MHz oscillator. PC board is 1.25"H x 0.9"W, to fit inside the waveguide in Figure 2.

I coated the finished RFCs with a coat of coil "Q" dope. You could also use shellac or clear fingernail polish. If you use the latter, be sure to use *clear* polish, since some colored types contain metal flek that might cause trouble. The purpose of the coating is to hold the coil, keeping the turns in place.

A positive ground or negative DC power feed makes the oscillator compatible with the brick oscillator. If you wish, you can convert this to negative ground. The second stage of the oscillator unit is a buffer amplifier. This stage isolates the oscillator and load to improve stability and prevent loading of the crystal oscillator.

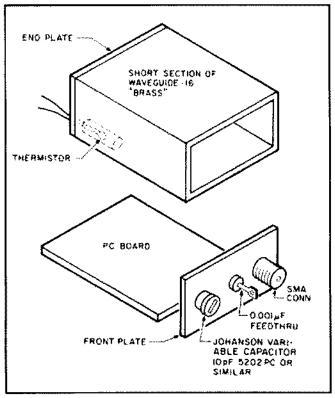


Figure 2. The thermistor is placed in tube on the inside of the waveguide with thermal grease.

Frequency Accuracy

Test the circuit with the adjustable capacitor set to about mid-value so the oscillator can drop out of oscillation. This is normal since the circuit works only over a narrow range of adjustment. If you use the circuit in a non-oven crystal, set the frequency with the capacitor, and that's it. If you use an oven-type crystal, its frequency will be quite high before the oven cycling. Oven type crystals pull low in frequency as the oven is cycling (heating) to its preset temperature. When this is translated, considering multiplication to our 5.7 GHz band, errors in the order of 60 kHz are common.

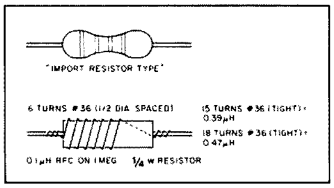


Figure 3. RFC construction. The standard Allan Bradley type "RC" flat body is great for coil-winding.

That equals about 1 kHz at the crystal frequency. You may get tired of hearing about frequency accuracy, but when you relate it to the low bands, remember that most rigs can give a reliable readout to 100 hertz. Why, then, should we not expect the same tolerances for microwave converters? If we are going to use two tin cans and a piece of string, a crystal detector is just fine. Using modern, stable transceivers in this microwave converter application is not only a good use of expensive equipment, it's cost effective, too.

By the way, CK-05 capacitors are really chip capacitors in disguise. These modern capacitor types are enclosed in a square epoxy case. They are very stable and display a higher *Q* than the older disc ceramic types, which you can also use in this circuit. I just happened to be out of some values of the disc types.

A note: With diligence and a pair of wire cutters, you can free the chip capacitor from the epoxy case and remove the chip cap for PC board use. You will destroy several caps until you get the hang of how to chip away the epoxy at the edges without fracturing the chip cap inside. I caution you to wear a pair of safety glasses. SAFETY ALWAYS COMES FIRST!

New Products

I have received several requests for information on just where to purchase waveguide for construction projects, and how to determine frequency on the 10 GHz band. Emcom Industries (Ed

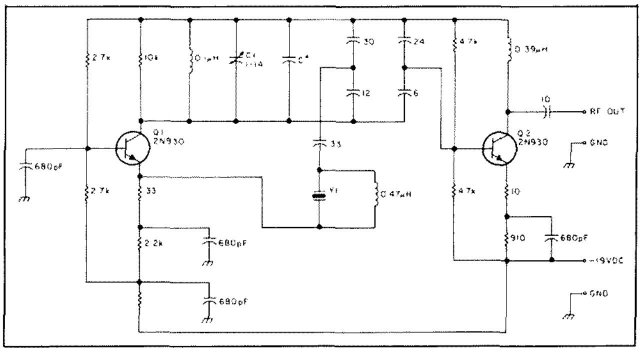


Figure 4. Schematic for the 100 MHz oscillator. Y1 is 85 to 106 MHz, depending on the frequency desired.

Emich), 10 Howard St., Buffalo NY 14206, tel. (716) 852-3711, will accept orders *for* brass waveguide. Cost is $6.50 a foot, plus shipping.

Two- to three-foot lengths are just right for construction of feed systems for dish antennas, with larger sections used for low-loss home station runs. For comparison, I used some 40 feet of waveguide in my home station on 10 GHz, putting all microwave hardware and high power amplifiers inside the shack for easy modifications and adjustment.

Emcom is currently developing a cavity wavemeter for frequency determination (10 GHz) and has other microwave-related projects in the mill. I will provide details as I receive them.

Mailbox Comments

Ed Cole AL7EB writes that he plans to start 10 GHz operation when he returns from his job in Valdez, Alaska. He says he has collected several CG-176/U couplers and an assortment of 1N23 type diodes to start construction with. He has two military, surplus weather-tight boxes that he gutted to hold the 30 MHz IF preamp gunn control, CW IDer, and a MA/COM gunnplexer.

His home is in Hope, Alaska. With Anchorage only 25 miles north over the water, Ed plans line-of-sight communications from the top of his tower to Anchorage. Later, Ed wants to try a shot across Cook Inlet, from Homer, Alaska (1000-foot Diamond Ridge), to Kodiak Island, about 140 miles to the south. Ed says it has been over fifteen years since he was last on microwave, and he is looking forward to getting back on.

Mike Baker in Gainsville, Florida, writes that the local group is interested in putting a beacon on a TV tower and needs a set of plans for construction of "omni 10 GHz antennas." Mike mentioned the slot antenna, and I sent him copies of this design. A 10 GHz slot antenna requires several slots (about six to a side) centered about the middle of the waveguide. The slots couple RF out similar to the way a stacked monopole antenna does.

Our microwave group is experimenting on omni antennas for both horizontal and vertical polarization. The polarization is affected by the placement (front, face, or side) of the slots in the waveguide. Slot dimensions are critical, and while you can construct the antenna at home, it requires care.

At present I don't know of any company selling slot antennas for the amateur budget. Commercial slots manufactured to mil-specs cost accordingly—sky high. I am in the process of testing several variations on the beacon slot antenna, and I'll inform you of results as they develop.

Mail-Box Material

Due to the large volume of mail I receive, next month this column will be dedicated to questions and answers from you, the readers. Going over common problems with circuitry and application, we should be able to clear up some of the basic questions you have submitted to me. Future columns will cover the 6 GHz system I am building, and I will let you know what I find out about the surplus 6 GHz equipment.

Let me know about the systems and frequencies your construction projects involve, and let me know if you have any photos of them for the column. This is your column. Write to me about any ideas you'd like to see developed. I hope you are as wild as I am about building; it's a germ we need to spread around. As always, I will answer questions related to this and other VHF/UHF or microwave items. For a prompt reply, please send an SASE. 73, Chuck WB6IGP

Number 24 on your Feedback card

BARTER 'N' BUY

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73 Flea Market*, Barter 'n' Buy, costs you peanuts (almost)—comes to 35¢ a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to the *Barter 'n' Buy*, Donna DiRusso, Forest Road, Hancock NH 03449 *and get set for the phone calls.*

HAM RADIO KITS & ASSEMBLIES for various *QST* & *73* construction articles. We also offer books and electronic components. For catalog, send legal size SASE w/45¢ postage or $1.00 to A & A Engineering, 2521 W. LaPalma #K, Anaheim CA 92801. BNB259

QSLs TO ORDER. Variety of styles, colors, card stock. W4BPD QSLs, PO Drawer DX, Cordova SC 29039. BNB260

THE DX'ERS MAGAZINE Up-to-date, informative, interesting. Compiled and edited by Gus Browning W4BPD, DXCC Honor Roll Certificate 2-4. Send for *free* sample and subscription information today. PO Drawer DX, Cordova SC 29039. BNB261

AZDEN SERVICE by former factory technician. Fast turnaround. PCS-300 NiCads $36.95. Southern Technologies Amateur Radio, Inc., 10715 SW 190 St. #9, Miami FL 33157. (305) 238-3327. BNB262

DRAKE TR7 w/aux extra xtals MS7 spk. All mint PS7. AMP supply LK500ZC used little: frequency counter mint: Collins 32-S3C. Howard (717) 458-6243 after 5 PM EDT. BNB263

QSL CARDS- Look good with top quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSLs, Dept A, 310 Commercial, Emporia KS 66801, or FAX request to (316) 342-4705. BNB434

SUPERFAST MORSE CODE SUPEREASY. Subliminal cassette. $10. LEARN MORSE CODE IN 1 HOUR. Amazing new supereasy technique. $10. Both $17. Moneyback guarantee. Free catalog: SASE. Bahr, Dept 73-4, 1196 Citrus, Palmbay FL 32905. BNB531

SB-220/221 OWNERS: 20 detailed mods which include 160-6 meter operation, QSK, +enhanced p.s. 50% rebate for new mods submitted! 9 pages of 3-500Z tech info. $11 postpaid.—Info. SASE, BOB KOZLAREK WA2SQQ, 69 Memorial Place, Elmwood Park NJ 07407. BNB581

ROSS' $$$$ USED October (ONLY) SPECIALS: KENWOOD SM-220/BS8 $429.90, AT-230 $179.90, TS-520S/WCWFL $479.90, TR-3600A/TU35 $259.90, TS-120S $439.90; MFJ 984 $229.90, 989B $229.90; ICOM 751/FL-44 $899.90, IC-761 $1,699.90; RP3010/CABN. $899.90; COLLINS 30L1 (ROUND) $999.90, 312B-4 $349.90. LOOKING FOR SOMETHING NOT LISTED?? CALL OR SEND S.A.S.E., HAVE OVER 190 USED ITEMS in stock. MENTION AD. PRICES CASH, FOB PRESTON. HOURS TUESDAY-FRIDAY 9:00 TO 6:00, 9:00-2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. ROSS DISTRIBUTING COMPANY, 78 SOUTH STATE, PRESTON ID 83263. (208) 852-0830. BNB654

WRITTEN EXAMS SUPEREASY. Memory aids from psychologist/engineer cut studytime 50%. Novice, Tech, Gen: $7 each. Advanced, Extra: $12 each. Moneyback guarantee. Bahr, Dept 73-4 1196 Citrus, Palmbay FL 32905. BNB691

ROSS' $$$$ NEW (SOME OPEN BOX AND 1 OF A KIND) October (ONLY) SPECIALS: KENWOOD TS-680S $929.90, TH-26AT $279.90, ICOM IC-O4AT $279.90, IC-765 $2399.90; YAESU YC-500S $289.99, FT-711RH $359.99, AEA PK64A/HFM $149.99, MP-20 $49.99; ASTRON RS-12A $65.90, RS-35M $149.90, ALINCO EP-2010 $89.99, EP-2030 $99.99; CUBIC (SWAN) ASTRO-D $1499.90, RPT (REPEATER) $999.99; COLLINS HF-380+ACC $6,000.00, AC-2828 $58.50; SANTEC ST-220UP $200.90, ST-440UP $245.99; DRAKE 7000E $249.99, PS-3 $79.90. SEND S.A.S.E. FOR USED, OPEN BOX LIST and top 500 BEST SELLERS. ALL L.T.O. (LIMITED TIME OFFER) LOOKING FOR SOMETHING NOT LISTED?? CALL OR WRITE. Over 9004 ham-related items in stock for immediate shipment. Mention ad. Prices cash, F.O.B. PRESTON. HOURS TUESDAY-FRIDAY 9:00 TO 6:00, 9:00-2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. ROSS DISTRIBUTING COMPANY, 78 SOUTH STATE, PRESTON ID 83263. (208) 852-0830. BNB709

HAM RADIO REPAIR all makes, models. Experienced, reliable service. Robert Hall Electronics, Box 280363, San Francisco CA 94128-0363. (408) 729-8200. BNB751

WANTED: Ham equipment and other property. The Radio Club of Junior High School 22 NYC, Inc., is a nonprofit organization, granted 501(C)(3) status by the IRS, incorporated with the goal of using the theme of ham radio to further and enhance the education of young people nationwide. Your property donation or financial support would be greatly appreciated and acknowledged with a receipt for your tax deductible contribution. Meet WB2JKJ and the "22 Crew" on the classroom net, daily, 1100-1230 UTC, 7.238 MHz. Then from 1230 to 1900 on 21.395. Celebrate the "22 Crew" tenth anniversary by working our special event station, October 17-19 on our regular frequencies and times, get an incredible QSL. Write us at: PO Box 1052, New York NY 10002. Round the clock Hotlines: VOICE (516) 674-4072, FAX (516) 674-9600. BNB762

"HAMLOG" COMPUTER PROGRAM Full features. 18 modules. Auto-logs, 7-band WAS/DXCC. Apple, IBM, CP/M, KAYPRO, TANDY, CR8 $24.95. 73-KA1AWH, PB 2015, Peabody MA 01960. BNB775

LAMBDA AMATEUR RADIO CLUB International amateur radio club for gay and lesbian hams. On-air skeds, monthly newsletter, and annual gathering at Dayton. (215) 978-LARC. PO Box 24810, Philadelphia PA 19130. BNB812

HAM RADIO REPAIR CENTER, quality workmanship. Solid state or tube, all makes and models. Also repair HF amplifiers. A-Z Electronic Repair, 3638 East, Indian School Rd., Phoenix AZ 85018. (602) 956-3024. BNB874

INEXPENSIVE HAM RADIO EQUIPMENT. Send postage stamp for list. Jim Brady—WA4DSO, 3037 Audrey Dr., Gastonia NC 28054. BNB890

WANTED: BUY & SELL All types of Electron Tubes. Call toll free 1 (800) 421-9397 or 1 (612) 429-9397. C & N Electronics, Harold Bramstedt, 6104 Egg Lake Road, Hugo MN 55038. BNB900

ELECTRON TUBES: All types & sizes. Transmitting, receiving, microwave . Large inventory = same day shipping. Ask about our 3-500Z special. Daily Electronics, PO Box 5029, Compton CA 90224. (800) 346-6667. BNB913

COMMODORE 64 HAM PROGRAMS—8 disk sides over 200 Ham programs $16.95. 25¢ stamp gets unusual software catalog of Utilities, Games, Adult and British Disks. Home-Spun Software, Box 1064-BB, Estero FL 33928. BNB917

BATTERY PACK REBUILDING: SEND YOUR PACK / 48HR SERVICE. ICOM: BP2/BP3/BP22 $19.95, BP5 $25.95, BP7/BP8 $32.95, BP70 $29.95. KENWOOD: PB21 $15.95, PB21H $21.95, PB25/26 $24.95. YAESU FNB9 $19.95, FNB10 $23.95, FNB11 $27.95, FNB4/4A $36.95, "U-DO-IT INSERTS" ICOM: BP2 $17.50, BP3 $16.95, BP5 $22.95, BP7/8 $27.50, BP22 $17.95, BP70 $25.95. KENWOOD: PB21 $12.95, PB21H $18.95, PB24/25/26 $19.95. TEMPO: S1/2/4/15 $22.95. YAESU: FNB4/4A $32.95, FNB9 $16.95, FNB10 $18.95. AZDEN: $19.95, "NEW PACKS". ICOM: BP5 $43.95, BP8 (BASE CHG ONLY) $39.95. YAESU: FNB2 $19.95, FNB12 $44.95. SANTEC: 142/1200 $22.95. FREE CATALOG. $3.00 Shipping/order. PA +6%, VISA-M/C + $2. CUNARD, R.D. 6 Box 104, Bedford PA 15522. (814) 623-7000. BNB931

LONG WAVE 1750 METER products and kits by Curry Communications. Please send SASE to 852 North Lima St., Burbank CA 91505. BNB932

SATELLITE MONTHLY AUDIO CODES 1 (900) HOT-SHOT intended for testing only. $3.50 per call. BNB938

GROUNDING THE AMATEUR RADIO STATION. Step-by-step, 12-page illustrated guide. Down to Earth instructions!! ONLY $7 ppd! KB4UGW's SHACK SOLUTIONS, PO Box 581-s, Leeds AL 35094-0581. BNB940

HOME-BREW—PROJECTS LIST SASE WB2EUF, Box 708, East Hampton NY 11937. BNB943

WANTED IBM-PC/CLONE AND PACKET equipment for Russian amateur emergency radio service—tax deductible. Dave Larsen KK4WW, PO Box 341, Floyd VA 24091. (703) 763-3311/382-4458. BNB945

HAM RADIOS DON'T DIE! They just get repaired by K-Gor Electronic Repair, Inc., 6154 Circle View Drive, Kansas City MO 64118. (816) 454-6700. BNB952

BANDMASTER QUADS. You've seen them in *QST, CQ, 73*, and *Worldradio*. Find out why. UHF, VHF, HF. Free catalog. AAE, 3164 Cahaba Heights Rd., Birmingham AL 35243. (205) 967-6122. BNB955

WANTED: Pre-1980 microcomputers and publications for museum. KK4WW, Dave Larsen, Blacksburg Group. PO Box 1, Blacksburg VA 24063. (703) 763-3311. BNB956

WANTED: Your help donating IBM-PC clone, technical and callbooks for IARN emergency radio service in USSR. I will personally deliver equipment to UB5WE. David Larsen KK4WW. (703) 763-3311. BNB957

25-420 MHZ MILITARY AVIATION FREQUENCY DIRECTORIES for NORTH AMERICA—over 20,000 newly researched listings. Send SASE info to: for-HAP3, Box 754, Flemington NJ 08822-0754. (201) 806-7134. BNB958

BACK-PACKET Jump back-and-forth between packet radio and any MS-DOS application with the press of a key. Source code included. $19.95 to WA4APL, 6521 Creekstone Place, Charlotte NC 28213. BNB959

FREE Ham Gospel Tracts. SASE. N3FTT, 5133 Gramercy, Clifton Hts. PA 19018. BNB960

MacSAMUEL MORSE CODE TUTORIAL SOFTWARE for the Macintosh. Speeds to 90 wpm. Standard or Fransworth mode. Random character and word generation. Random QSO simulation. Also, send code from your own text files. Send $22.00 plus $2.00 shipping and handling to: Avant Systems, PO Box 5437, Pittsburgh PA 15206. BNB962

WANTED: AUTHORS AND MANUSCRIPTS Radio Amateur Callbook, publisher of the world's most comprehensive list of directories and technical books for ham radio operators, is currently seeking potential authors and manuscripts. If you are a licensed amateur and have published technical papers, conducted professional seminars or solved important real-world problems in the fields of commercial and amateur radio; television and satellite broadcasting; and/or telecommunications; we would like to hear from you. We invite you to submit your manuscript proposal and outline for review. For a complete catalogue and Author Questionnaire, please contact Herb Nelson, Radio Amateur Callbook, 925 Sherwood Drive, Box 247 Lake Bluff IL 60044 USA, telephone 1 (708) 234-6600. 8:00 a.m.-4:00 p.m. CDT BNB963

WANTED for my Drake R4C CW-filters 1,5-0,5-0,25. Kettling, 6 Krockhaus, 463 Bochum/Germany. BNB964

KB0ZP CONTEST LOG—(MSDOS) Latest version from author. 4000 Contacts. Scores 15 contests. Separate utilities program for printouts, etc. Unlimited Modes/Bands. Data compatible with your database or file program. QSL information, mailing labels a snap. Restore memory after power down. Many extras. CompuServe 73517,1054. Shareware $5. KEBEL, PO Box 2010C, Sparks NV 89432. BNB965

PRINTED CIRCUIT BOARDS for projects in *73, Ham Radio, QST, ARRL Handbook*. List SASE. FAR Circuits, 18N640 Field Ct., Dundee IL 60118. BNB966

COLLINS KWM-2, PM-2 $450. Galaxy V, VFO, station console, 2000 amp, $275. Kenwood TS-430S, Astron RS-35A, $700. Heathkit SA2500 auto antenna tuner w/balun, $235. ICOM IC-2GAT, $300. Amplifier parts, much more, S.A.S.E. KJ6KK, Box 898, Pahrump NV 89041. (702) 727-7181. BNB968

WANTED Kenwood TS-790A. WB8ERN, 4839 Beaune, Ludington MI. (616) 843-2162. BNB969

SLACK ENTERPRISES 2 METER J Condo quad, short low band ants & more, 12-page flyer $3.00. SLACK ENTERPRISES: 101 Royal Park Drive, Apt. 2H, Oakland Park FL 33309. BNB967

"Today's People—Barry Goldwater." Meet amateur radio's elder statesman Barry Goldwater K7UGA in an interview taped at the Goldwater Ranch exclusively for hams, teachers and amateur radio instructors. See Barry's station and join teen-interviewer Kelly Howard N6PNY as she questions K7UGA on career, family and amateur radio. 7 minutes and in color on VHS—perfect for classroom instruction and radio club presentation. Produced by the team that brought you "The New World of Amateur Radio." Only $19.95 plus $3.00 shipping/handling prepaid (no CODs) to Bill Pasternak WA6ITF, 28197 Robin Avenue, Saugus CA 91350. BNB970

Continued from page 32

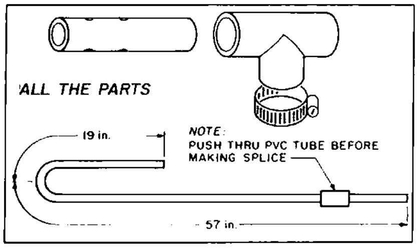


Figure 3. Placing the PVC tubing.

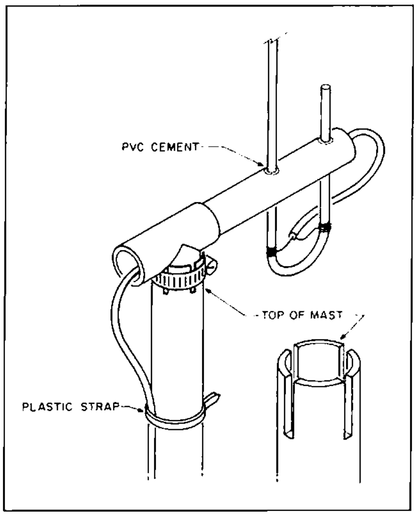


Figure 4. The completed unit.

You will need to strip back the braid of the coax about four inches to have enough room to secure the ends to your clamps. After your final adjustment for minimum SWR, you may want to trim some of this off for a little neater look. It makes little difference which leg you attach the center conductor of the coax to, but I felt that there was a slight edge in having the center conductor connected to the long leg. When I was through playing, that is the way I left it.

Adjusting the Antenna

Hook up a VHF SWR bridge between your rig and the J-Pole. Try different settings of the feed point and, of course, look for the lowest SWR. I tried everything I could think of, from feeding at the end of the short leg to sliding down to the bottom of the "J" loop (that is where I found the best SWR). My SWR is 1.1:1 at 146.00 MHz, feeding approximately two inches up from the bottom of the loop, or about four inches apart around the loop. Even at the band edges, i.e. 144 and 148 MHz, the SWR is less than 2:1.

A little embellishment that won't make the antenna work any better, but will make it look more "factory", is to add red plastic tubing caps on the ends of each leg. Also you may want to drill a small hole in the bottom of the loop to let any moisture that might accumulate inside to drain out.

In this day of cable TV, you should have little trouble finding an old TV antenna. If you don't have one yourself, ask a friend or a neighbor—you can probably get one just for taking it down. ■

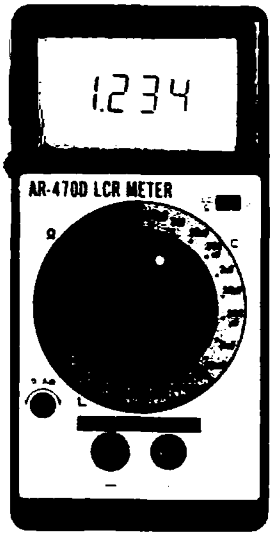
Number 25 on your Feedback card

NEW PRODUCTS

Compiled by Hope Currier

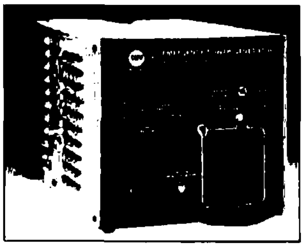
PRODUCT OF THE MONTH

ARI/AMERICAN RELIANCE



The AR-470D from ARI/American Reliance Inc. is a convenient, drop-proof hand-held device that has all the features and benefits of a bench-top LCR meter at only 20% of the price. It displays a fast reading of inductance, capacitance or resistance on its 2000-count, 3½ digit, liquid crystal display. It provides seven inductance ranges from 200 µH to 200H, nine capacitance ranges from 200 pF to 20 mF, and eight resistance ranges from 2 ohms to 20 megohms, offering a maximum resolution of 1 milliohm. In addition, with its D factor feature and 120 Hz/1 kHz test frequencies, the 470D can be used in the following applications: finding opens or shorts in transformers and transmission lines; capacitance and resistance measurements for surface-mount or chip-type components; precision measurements of milliohm applications; and phase detection, mutual inductance, and ratio of turns for transformers. There is a "low battery" warning with the built-in LOBAT display, as well as dissipation factor measurements. SMD or chip-type component test probes are available.

The AR-470D is priced at $250. Contact *ARI/American Reliance, Inc., 9952 E. Baldwin Place, El Monte CA 91731. (818) 575-5110; FAX (818) 575-0801.* Or Circle Reader Service No. 201.



TRIPP LITE

The new Tripp Lite EPG-1200 is a solid-state, 120 VAC electronic power generator designed to take the place of gasoline-powered generators during blackout conditions. The EPG-1200 provides clean, quiet, safe emergency power in a compact unit where the pollution, fumes or noise of such a generator are unacceptable or impractical. It supplies up to 1200 watts of regulated AC power from the user-supplied battery pack. Simple, manual switchover operation powers equipment during blackouts for extended periods. Frequency-control to within ±½ Hz lets frequency-dependent equipment like VCRs operate perfectly.

A heavy-duty 20 amp battery charger recharges the battery bank whenever AC line power is present. A low-voltage cutoff circuit prevents the unit from over-draining the batteries during operation. The EPG-1200 features four AC outlets and manual switchover from AC line power to inverter operation. The rugged, no-maintenance construction will give you years of trouble-free service.

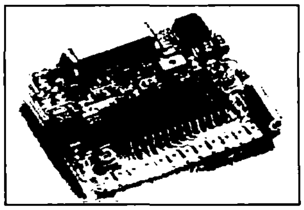
The suggested retail price is $620. Contact *Tripp Lite, 500 N. Orleans, Chicago IL 60610-4188. (312) 329-1777.* Or circle Reader Service No. 204.

VAN GORDEN ENGINEERING

The Hi-Q antenna end insulators from Van Gorden Engineering are rugged and lightweight, and have high dielectric qualities and excellent resistance to weather conditions. These insulators can be used as guy wire strain insulators, as end or center insulators for antennas, for constructing antenna loading coils, for designing multiband traps, and for building rotary inductors in tank circuits. They are designed to be used in either a strain or compression type installation. Spiral ribs let you wind loading coils or traps right on the insulator.

Hi-Q Antenna End Insulators are available from most ham radio dealers for $4 per pair. For more information contact *Van Gorden Engineering, P.O. Box 21305, S. Euclid OH 44121. (216) 481-6590; FAX (216) 481-8329.* Or circle Reader Service No. 205.

COMMUNICATIONS SPECIALISTS



Ever since the introduction of digital continuous tone-coded squelch systems, radio shops and hams have been asking for an "after market" manufactured board. Now Communications Specialists, Inc. is offering the DCS-23 Digital Encoder-Decoder, compatible with all DCS systems. This new board is constructed using surface mount technology. It measures just 1.36" x 1.18" x 0.25", permitting installation on all mobile and most portable radios. All industry-standard digital codes are field-programmable using simple PCB jumpers. The board's design uses a crystal-controlled CMOS microprocessor which permits operation on 6 to 20 VDC at 8 mA. All connections are made with color-coded jumper wires connected to a microminiature plug and socket.

The DCS-23 is priced at $60 and comes with an illustrated brochure and instruction sheet, and a one-year "no hassle" warranty. Contact *Communications Specialists, Inc., 426 West Taft Avenue, Orange CA 92665-4296. Phone (800) 854-0547 or (714) 998-3021, or 24-hour FAX (714) 974-3420.* Or circle Reader Service No. 202.

BRIAN BEEZLEY K6STI

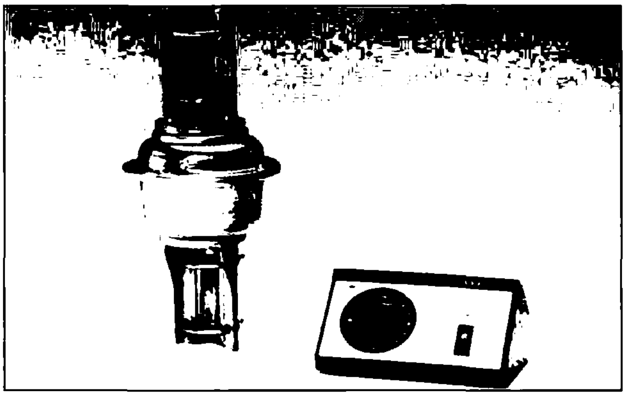
K6STI has released a new MNC program for IBM-compatible computers. MNC uses optimized, hand-coded assembly language in the kernel code of the MININEC algorithm, substantially improving performance. Unlike compiler-generated code, MNC uses in-line coprocessor instructions for maximum speed. In addition, MNC makes full use of the on-chip coprocessor stack to minimize slow off-chip memory accesses. Where possible, MNC maximizes parallel execution of host processor and coprocessor instruction streams. MNC is believed to be the fastest implementation of the MININEC algorithm ever attempted on a personal computer.

MNC is offered as a $40 option for the MN 3.5 antenna analysis program. MN 3.5, priced at $85, features a three-dimensional display of antenna geometry. Contact *Brian Beezley K6STI, 507½ Taylor St., Vista CA 92084.* Or circle Reader Service No. 206.

CHESTER QSL CARDS

Chester QSL Cards now offers you the ability to order QSL cards on-line using their new Bulletin Board System. You can also monitor your order and obtain current information regarding shipping dates. By using the BBS, you can save $5 on your order to help offset the cost of your call. You can also request free samples or order form packets. The only terminal requirement is the ability to display 80 columns and 24 lines. You may access the bulletin board from 6 p.m. to 8 a.m. CST Monday through Friday, and 24 hours a day Saturday and Sunday. Other options on the BBS include a message center and the ability to upload and download files.

To access the bulletin board, phone (316) 342-8818; 300, 1200, 2400 baud, 8 bits, no parity, 1 start, 1 stop. For more information, contact *Chester QSL Cards, 310 Commercial, Emporia KS 66801. (316) 342-8792. Or circle Reader Service No. 207.*



YAESU

Yaesu USA has announced a new light-duty rotator, the G-250, designed for light to medium UHF, VHF and FM radio and television antenna arrays for remote control operation. The controller is a desktop unit which provides 360° indication of actual antenna compass direction. Like all Yaesu rotators, the G-250 is designed to last a lifetime. It is housed in weatherproof, melamine-coated die-cast aluminum, and is permanently lubricated to insure maintenance-free operation under all climate conditions.

The suggested retail price for the G-250 is $111. Contact *Yaesu USA, 17210 Edwards Road, Cerritos CA 90701. (213) 404-2700. Or circle Reader Service No. 203.*

Number 26 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check /HAMFESTS on our BBS (603-525-4438) for listings that were too late to get into publication.

Visit the 73 booth at
... Boxboro, MA on Oct 13 & 14
... Brooklyn Park, MN on Oct 27

OCT 5-14

PERRIS, CA The Lee De Forest ARC, assisted by six local ARCs, will sponsor the Riverside County Fair at 18700 Lake Perris Drive. Special Children's days and Handicapped day. Admission: 12 and under free, adults $5. Call contact for Senior's Day and fee. Talk in 145.240 down 6. Contacts: *Ruth Ann Rich N6HIW, 41020 Benton Rd., Hemet CA 92343, (714) 767-7603.* PKT BBS address *6N6HIW @ KA6JOB. Donna Lindsey N6OKS, (714) 926-4106. Jim Cameron KB6YBP, (714) 927-4555.*

OCT 6

PONCA CITY, OK The Kay Co. ARC, OIDAR and Cowley Co. ARC will jointly sponsor the Northern Oklahoma/Southern Kansas Swapmeet and VE Session. VE Exams start at 0930, at Pioneer Vo-Tech. Walk-ins only. Bring original license and original CSCEs plus photocopies of those documents for your 610 form. Swapmeet starts at 1300 hours at the Ponca City airport. Commercial vendors. Talk-in on 146.97 down. Contact *Mark Byard N5OGP, 504 Foster, Ponca City OK 74601 (405) 762-1966.*

OCT 6-7

WARRINGTON, PA The Mt. Airy VHF RC, Inc. will sponsor the Pack-Rat 19th annual Get-Together weekend Conference/Hamfest. The VHF Conference will be held at the Warrington Motor Lodge Sat. from 9 AM-5 PM. Cocktail hour and get-together at 6:30 PM in the Pack-Rat Hospitality Suite. Dinner at 7:30 PM, $16. Registration $8 in advance (by Sept. 23rd), $10 at the door (includes Sun. Flea Market). The Hospitality Suite will be open Friday evening for early arrivals. Make checks payable to Mt. Airy VHF Radio Club, Inc., and send SASE to: *HAMARAMA, PO Box 311, Southampton PA 18966.* Motel Reservations: *(215) 343-0373.* The Sun. Flea Market will be held from 7 AM-4 PM at the Bucks County Drive-In Theater, rain or shine. $5 at the door, no advance registration. Carload special $8. Tailgating $8 per space (bring your own table). Set-up at 6 AM. Talk-in on W3CCX 146.52 MHz.

OCT 7

HUNTINGTON, IN The Huntington County ARS will sponsor its annual Hamfest at the P.A.L. Club from 8 AM-3PM. Sellers set-up at 6 AM. Free parking. Handicap accessible. Admission $3.50 advance, $4 at the door. 8' tables $5 on first-come basis. Talk-in on 146.085/.685 and 448.975/443.975. Contact *Jim Covey KC9GX, 1752 Kocher St., Huntington IN 46750.*

PARAMUS, NJ The Bergen ARA will sponsor a Hamfest at Bergen Community College from 8 AM-2 PM. Free admission for buyers. VE Exams from 7 AM-10 AM. VE contact: *Pete Adely K2MHP, 13-30 Edward St., Fairlawn NJ 07410, (201) 796-6622.* Free parking. Sellers $7 per space. Talk-in on W2AKR 146.790. Contact *Jim Joyce K2ZO, 286 Ridgewood Blvd. No., Westwood NJ 07675. (201) 664-6725.*

YONKERS, NY The Yonkers ARC will hold a Hamfair, rain or shine, from 9 AM-3 PM at the Yonkers Municipal Parking Garage. Buyers admission $5, under 12 free. Sellers $10 per space (bring your own table). Set-up at 8 AM. No advance registration. Talk-in on 146.52, 146.865- or 440.150-. Repeater: WB2BNH. Contact *Y.A.R.C., PO Box 378, Centuck Station, Yonkers NY 10710. (914) 963-1021.*

SPRINGFIELD, OH The Independent Radio Assoc. will hold the Eighth Annual Hamfest/Computer Expo from 8 AM-4 PM, indoors at the Clark County Fairgrounds. Admission is $4 in advance, $5 at the door, with under 12 free. Tables are $6 advance, $7 at the door. Talk-in on 145.45 and 224.26 MHz. For reservations write: *Independent Radio Assoc., PO Box 523, Springfield OH 45501,* or call *Charlie WA8P, (513) 324-2896.*

HERSHEY, PA The Central PA 99/4A Users Group will sponsor its Fourth Annual CPUG Computer/Electronics Exposition from 7 AM-3:30 PM at the National Guard Armory, Palmdale. Pre-registration accepted through Aug. 3rd. Open to all ham radio, electronics and computer related groups. Contact *Dave Ratcliffe, (717) 238-5414; Barry Long, (717) 564-2974; Anthony (Tony) DeDonatis Sr., (717) 534-2056; Terry Longenecker, (717) 838-7843; The Data Factory, (717) 657-4992 or 4997 24 hrs, 8-N-1 300/1200/2400.*

OCT 13-14

AUGUSTA, GA The ARC of Augusta will sponsor the Augusta Hamfest/Computer Show at the Augusta-Richmond Co. Civic Center Sat. from 9:30 AM-5 PM and Sun. from 9:30 AM-3 PM. Outdoor Flea Market. One tailgating space free, extra adjacent spaces $5. Set-up at 5 AM Sat., 7 AM on Sun. Admission $4 advance, $5 at the door. Dealer 10' booths $40 ea. Flea market 8' tables $10 ea. Make checks payable to Amateur Radio Club of Augusta and mail to *Jim Abercrombie, PO Box 5943, Augusta GA 30906. (404) 790-7802.* Pre-registered VE Exams at 9 AM Sat. Walk-in VE Exams at 1 PM Sun. Send your completed 610 form with check for $4.95 made payable to ARRL/VEC to *Don Boltz WB4IGK, 121 Fox Trail Dr., North Augusta SC 29841,* for the Sat. exams only. Pay for Sun. exam at test time. Failed Sat. applicants may take the Sun. exam.

BOXBORO MA The New England ARRL convention at Boxboro, sponsored by the Federation of Eastern Massachusetts Amateur Radio Associations, will be held at the Sheraton Boxboro Hotel on the intersection of RTE 495 & 111. Flea Market opens at 6 AM. Convention at 9 AM. Entertainment and YL programs. Exams both days. 2 M Fox Hunt. Talk-in on 2 M-146.61, 146.82, 223.94, 449.925 and Boxboro repeater 146.67. For info call *W1THT, (617) 284-1024.*

WEST PALM BEACH, FL The Palm Beach Repeater Assoc. will hold their Fourth Annual Palm Beach County Hamfest/Computer Show at the South Florida Fairgrounds. RV sites. Admission $4 advance, $5 at the door. 10' x 15' booth $45. 10' x 10' booth $30. Bring your own tables, chairs, table cloths and extension cables, or pre-register for tables @ $10, chairs @ $1.50. Make checks payable and mail to: *PBRA Hamfest, PO Box 461, Lake Worth FL 33460.* Talk-in on 147.765/.165. Contact *Hal Gainen N4UIT, Vending Committee, 6332 Tall Cypress Cir., Lake Worth FL 33463. (407) 439-0805.*

OCT 14

WEST FRIENDSHIP, MD The Columbia ARA, Inc., will hold its 14th Annual CARA Hamfest at the Howard County Fairgrounds from 8 AM-3:30 PM. General admission $5, unlicensed spouses and children free. Tailgating $10 per space (includes 1 general admission per space). Call *(301) 997-5052.* Tables, 1-4 @ $20 each, 5 or more $18 each (includes 1 vendor admission per table). Talk-in on 146.52 simplex and 147.735/.135 crosslinked to 222.32/223.92. For info and reservations contact *C.R. Whetstone WA3YOH, c/o CARA, PO Box 911, Columbia MD 21044.* After Sept. 20, before mailing anything, call *(301) 486-2609, (301) 765-7918,* or to leave messages, *(301) 997-5052.*

SHELBY TOWNSHIP, MI The Utica-Shelby Emergency Communications Assoc. ARC will hold a Swap & Shop from 8 AM-2 PM at the Eisenhower High School at 6500 25 Mile Road. Advance tickets $2, $4 at the door. 6' tables $10. Trunk sales $5. Talk-in on 147.18+ and CB CH 34. Send payment and SASE to *Arpad R. Miklos WY8M, 3180 Chard, Warren MI 48092. (313) 751-3804.*

WAUKESHA, WI The Kettle Moraine RAC Inc. will hold its 12th Annual Ham/Computer Swapfest at the Waukesha County Exposition Center, Hwys J & FT, from 8 AM-1 PM. Set-up at 6 AM. Tickets are $4 advance, $5 at the door. Reserved tables $5 for each 4' length. Admission ticket required. Reserve before Oct. 6. Exams by Badger Examiners. Send SASE, check payable to *KMRA Swapfest, PO Box 276, Waukesha WI 53187-0276.*

OCT 19

VERONA, NY The Madison-Oneida ARC will hold VE Exams at the Madison-Oneida BOCES on Spring Road beginning at 7 PM. All exams offered. Technician through Extra cost is $4.95. Talk-in on 145.37. Contact VE *Leonard Popyack WF2V, (315) 853-8974, or on 146.79, 145.37, WF2V @ WA2TVE, or POPYACK@TOPS20.RADC.AF.MIL.*

OCT 19-21

EL PASO, TX The Third Annual HAMFIESTA will be co-sponsored by the El Paso ARC, Sun City ARC, West Texas Repeater Assoc., Bilingual ARC, and Chapter 64 QCWA. This is an international affair in co-operation with Mexico, which will allow Americans attending the HAMFIESTA to enjoy shops, hotels and the race track in Juarez, Mexico. For info contact *W.J. Deragisch, 301 Ridgemont Drive, El Paso TX 79912-5330. (915) 584-1649.*

OCT 20

SELMA, NC The Triangle East ARA will hold its Second annual ARRL sanctioned Hamfest at the Smithfield Moose Lodge from 8:30 AM-3:30 PM. Set-up at 6:45 AM. Admission: Adults $4 in advance, $5 at the door. Children under 12 free. Inside table and two chairs $6. Outside space $3. Pre-registration required for VE Exams. Send $4.95 and completed 610 to *TEARA Hamfest, c/o Vince Yakamavich, AA4MY, 220 Carriage Trail, Raleigh NC 27614. (919) 847-8512 (evenings 7-9).*

GRAY, TN The 10th Annual Tri-Cities Hamfest will be held at the Appalachian Fair Grounds. Sponsors are the Kingsport, Bristol and Johnson City Radio Clubs. RV hookups. Admission $5. Mail inquiries to *PO Box 3682 CRS, Johnson City TN 37602.*

GREENWOOD, NOVA SCOTIA The Greenwood ARC, VE1WN, will hold their Second Annual Ham Fleamarket from 9 AM-3 PM at Gilwell Hall. Admission is $2. Talk-in on 146.52 and 146.07/.67 MHz. Contact *Lance Peterson VE1VCL, Greenwood ARC, PO Box 63, Greenwood Nova Scotia, Canada B0P 1N0.*

OCT 21

STIRLING, NJ The Tri-County Radio Assoc. will hold a Hamfest/Flea Market from 8 AM-2 PM. Take Valley Rd. to Passaic Township Community Center. Admission $3, children under 12 free (with parent). Limited reserved tailgating. Wheelchair accessible. Tables $8; with AC, $10. Talk-in on 147.255/.855, 146.52. For reservations: *Dick Franklin W2EUF, 23 Shawnee Road, Cranford NJ 07016. (201) 276-6522.*

CENTRALIA, IL The Centralia Wireless Assoc., Inc., will hold its annual Hamfest at the Kaskaskia College Gymnasium beginning at 8 AM. Set-up at 7 AM. Flea Market space (including one table), $5. Free parking. Admission/Prize tickets $2 each or 3/$5. Talk-in on 147.27/.87 and 443.2/448.2. Mail ticket orders with an SASE to *Centralia Wireless Assoc., Inc., Hamfest Tickets, PO Box 1166, Centralia IL 62801.* For info call *Bud King WA9U, (618) 532-6606,* or write to *CWA, Inc.* at the above address.

BENSALEM, PA The Penn Wireless Assoc. will sponsor Tradefest '90 at the Yezzi Athletic Field beginning at 8 AM. Set-up at 6:30 AM. Admission $3, $7 per carload. Kids 12 and under free. Spaces $5. Multiple spaces guaranteed by advance payment. VE Exams. Tailgating. Talk-in on 146.52 and 146.925/.325. Send checks with SASE to *PWA Tradefest '90, PO Box L-734, Langhorne PA 19047.* For info call *Steve at (215) 752-1202.*

OCT 27

BROOKLYN PARK, MN The Sixth annual Hamfest Minnesota & Computer Expo will be held at the Hennepin Technical College from 7:30 AM-3 PM. Admission $4.50 advance, $6 on the day of the show. VE Exams, no walk-ins. Pre-register by sending SASE, completed 610 form, photocopies of current license and code credit plus $4.95 (payable to ARRL-VEC) to: *VE Exams, Inc., Jerry Jensen WT0W, 10900 Ewing Ave. S., Bloomington MN 55431. (612) 888-6187.* Fleamarket tables, main area, $18 each, set-up 6:30 AM. 2nd floor, full table $12 each, set-up 7 AM. Hallway, full table $6 each, set-up 7 AM. Hallway, half table, $6 each. You must have an admission ticket to display in the fleamarket area. Maximum of 4 tables per seller in main area. No limit in other areas. Send SASE with check payable to *Hamfest Minnesota & Computer Expo,* to: *Hamfest Minnesota & Computer Expo, Box 5596, Hopkins MN 55343.*

OCT 28

CROMWELL, CT The Middlesex ARS/Connecticut AR Emergency Service, with the Cromwell Middle School ARC, will hold a Hamfest at the Cromwell Middle School beginning at 9 AM. Set-up at 7 AM. Donation $4 adults, under 12 free. VE Exams info: *Ed Kerns KN9Y (203) 342-4300.* Talk-in on 147.09/.69, 444.625/449.625. FM simplex: 146.52 MHz. For general info: *Jack Chapman WA1K, (203) 347-8745 or (203) 347-1134; Brian Battles WA1YUA, (203) 666-1541 or (203) CALL-YUA.* For table reservations call *Jack WA1K at the above numbers, or Kathy Allison KA1RWY, (203) 742-7727).*

SPECIAL EVENT STATIONS

OCT 6-7

COLUMBUS, OH The Columbus ARA will operate Station W8TO in conjunction with the Columbus USA Festival. The festival salutes the City of Columbus and the Explorer Christopher Columbus. Time: Sat. 0000Z-2400Z Sun. W8TO will operate SSB at the festival from Sat. 1500Z-0300Z Sun., and from 1500Z-2400Z Sun. Frequencies 7.240, 14.340, 21.375, 28.500 MHz (all frequencies ±10 kHz). Exchange name, QTH and signal report. Commemorative QSL to all who confirm W8TO contact and all SWLs who confirm hearing W8TO. Certificates to stations who contact, and SWLs who hear, at least 10 Columbus stations. Working W8TO equals six contacts; each band counts separately. Plaque awarded to the station that contacts the most Columbus stations. Address for QSL and Log submission: *Roger Dzwonczyk WB2EIG, 283 East Longview Ave., Columbus OH 43202, USA.* Send an SASE ($1 postage or 1 IRC) for QSL and certificate. Use 9" x 12" envelope for unfolded certificate. Otherwise use #10 envelope.

OCT 13

BOY SCOUT CAMPOREE STATION The Lockheed ARC and the West Valley ARA, in conjunction with the Santa Clara County Council, will operate Station WA6GFY from 10 AM-5 PM PDT, to introduce Amateur Radio to the 5,000+ Boy Scouts who will be participating in the Camporee. Frequencies: 14.23, 21.35, 38.4 MHz. Send a 9 x 12 SASE to: *Brian Davis KJ6WH, 3461 Fawn Dr., San Jose CA 95124.*

OCT 13-14

HARLINGEN, TX The South Texas ARS and the CAF Ghost Squadron, will operate Station N5CAF Sat. and Sun. from 9 AM-8 PM local time, to celebrate the Confederate Air Force Annual Air Show. Attempts will be made to contact several of the WWII aircraft in the CAF inventory. Listen for B-29, B-17, B-25, P-51, P-40, etc. Frequencies SSB 14260, 21260, 28460 kHz. For special QSL photo of the B-25, send your QSL and SASE to *Dr. David Woolweaver K5RAV, 2210 S. 77 Sunshine Strip, Harlingen TX 78550.*

OCT 17-19

NEW YORK, NY The Radio Club of Junior High School 22 will operate WB2JKJ daily from 1100-1900 UTC to commemorate the 10th Anniversary of the Club, and Education thru Communication. Frequencies: 7.238 and 21.395 MHz. For an outrageous card, contacts and SWLs may QSL to: *The 22 Crew, PO Box 1052, New York, NY 10002.*

OCT 31-NOV 1

FRANKENSTEIN, MO The Mid-MO ARC will operate WO0O from 2100Z Wed.-1400Z Thur. in celebration of Halloween. Frequencies: 35 kHz up from the bottom of the CW, Novice, and General phone subbands. For certificate, send QSL and SASE to *Jeff Kunce N0JUH, 1213 E. Dunklin, Jefferson City MO 65101.*

73 INTERNATIONAL

edited by C.C.C.

Arnie Johnson N1BAC
103 Old Homestead Hwy.
N. Swanzey, NH 03431

Notes from FN42

More sad news. Peter Strauss ZS6ET, 73's Hambassador to the Republic of South Africa, died in a light plane accident on July 30. According to a quick FAX from Phil Gray KA7TWQ, Hambassador for Mozambique, a message from an SARL representative said that Peter was apparently taking a test for his pilot's license when he was forced to take off after landing and crashed in the process. Peter was also a Councillor for the South African Radio League.

With the death several months ago of Ken Gott VK3AKU, Hambassador from Australia and Awards Manager for the WIA, this leaves another hole in our 73 representation. Peter and Ken were two of our most prolific correspondents, and we will miss both of them. See the South Africa portion of this column for Peter's last report.

Limon, Colorado: In last month's column, I wrote about the tornado hitting Limon, stating that the news reports did not mention ham involvement. I've received some responses about the "Limon Disaster," as it is now called in Colorado. One person believed I was saying that local hams were not prepared for or involved in the emergency. Careful reading shows that I was asking questions, not making statements. I just didn't know whether hams were involved or not, and I asked for information. The major TV networks, CNN, and wire-service reports did not mention hams at all.

The responses I received from hams advised me that they were the first to report the tornado to others outside the area, and that they took a very active part in disaster communications. Bravo! But I heard nothing of these facts on the East Coast. I just wish that the national TV networks and wire-services had been informed of ham involvement, or if they were informed, that they had broadcasted this information.

Edie Sheffield KAØMOA, Section Manager of the ARRL for Colorado, wrote me about the massive effort hams played in the Limon Disaster (see "Roundup," below). THEY PLANNED, THEY PREPARED, AND THEY WERE READY!

Checking The ARRL Repeater Directory, *I discovered that there are two 2-meter repeaters located in Genoa, just east of Limon. No slight intended to the owners and users of those repeaters. Again, the only statement I made was that ham involvement didn't make the national news.*

—Arnie N1BAC

Roundup

Japan From *The JARL News.* According to an investigation by the Ministry of Posts and Communications, amateur radio stations totalled an amazing 1,027,101 as of March 31, 1990, passing the million mark for the first time. In March 1970, the total was 100,000. Compared to last year, the rate of increase was 12%. 110,000 new amateur radio stations went on the air, the largest increase ever.

Sweden From *Radio Sweden.* Arthur Cushen has updated his book, *Radio Listeners Guide,* from 1988 to a new 1990 edition. The new edition includes coverage of New Zealand's new shortwave service, Printer Disabled Radio, New Zealand and Australian medium wave stations revisited, and updated information on sunspots, jamming, world time, and pirate radio.

You can order this 116-page book (in A4 format) from Gilfer Shortwave, Box 239, Park Ridge NJ 07656, USA. Cost is $18 U.S. In Australia and New Zealand, you can order from Arthur Cushen Publications, 212 Earn St., Invercargill, New Zealand. Cost is 22 Australian dollars or 24.20 New Zealand dollars.

USA/Colorado From Edie Sheffield KAØMQA, on AMATEUR RADIO AND THE LIMON, COLORADO, TORNADO (edited for space).

During the evening of June 6th, a devastating tornado swept through Limon, Colorado, and virtually destroyed all communication.... The Severe Weather Net (SW) spotters had been tracking the storms since 1 p.m. with nets in both Denver and the Colorado Springs areas.

Trained amateur radio weather spotters were covering the possible danger areas, and Tim Samaras WJØG, with his ATV camera, sent live pictures back to the National Weather Service in Denver. After Limon radar was knocked out by the tornado, the spotters provided the early reports and locations of several other tornados.

Limon is about 75 miles from Denver and just a bit closer to Colorado Springs. Pete Peterson NØAFR from Arriba was the first amateur on the scene, less than 30 minutes after the tornado hit, closely followed by Norm Michaels KAØEFF from Flagler. [The latter is] the EC (Emergency Coordinator) for Lincoln, Kit Carson, and Cheyenne counties. Other early arriving eastern plains hams included Buck Rodgers WAØDGJ and Keith Bowhan WØDGM of Genoa, and George Saum KØGS of Agate.

The Rocky Mountain Division Vice Director, Bill Sheffield KQØJ was alerted by David Richendifer WDØHNO that the Colorado State Patrol was requesting Amateur Radio operators in Limon. Bill alerted the Emergency Coordinators of Denver, Jeff Irvin KBØCHT and Mike Stansberry KØTER of Colorado Springs, and within an hour of the tornado, amateurs were en route to Limon from Denver and Colorado Springs.

During the first hours following the tornado, amateur radio operators handled priority messages for the Limon Police, the Lincoln County Sheriff, the Colorado State Patrol, and other fire and rescue groups; amateur radio communications were set up at both the Mile Hi Red Cross and the Pikes Peak Red Cross around the clock, providing emergency and health and welfare communications in and out of the area.

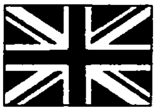
The second day a fresh batch of amateurs arrived at Limon, including Bob Ragain WB4ETT, DEC, Jim Lommen KC7QY, EC for Arapahoe County, and Bob Hitchens K8VOC, EC for Douglas County. By Friday, June 8th, priority communications were winding down and the amateur radio operators were concentrating on health and welfare traffic along with coordinating communications for the Red Cross, Salvation Army, and the NWS radar station in Limon.

The Pikes Peak 2 meter repeater WØYNE was the only usable repeater from Limon. The Hugo repeater went out with the storm and Denver repeaters and other Colorado Springs repeaters were not reachable. Mike KØTER tried to coordinate packet, but the distance was too great for the COS digi to work effectively, so health and welfare traffic was passed on HF and 450 MHz along with 2 meters.

The following is a partial listing of some of the amateurs involved during this communications effort.

NØAFR, NØAMP, NØBOH, NØCYR, NØDWT, N5EZL, NØFDA, NØIER, NØIEM, NØIKF, NØION, NØIZQ, NØKIC, NØKRW, NØJAA, NØJLH, NØLBI, WØBEG, WØDGM, WØDUM, W3TMR, KGØS, KOØJ, KTØH, KØZL, NXØE, NWØJ, WGØN, WJØG, WRØS, WUØN, WØVI, K4UBU, KC7QY, K8VOC, KØPGM, KØPGU, KØQBA, KØTER, KØWIQ, KØUEM, KCØTR, KDØNT, AL7GQ, KA3HBK, KA7EEJ, KA7JOR, KC4KGS, KAØEFF, KAØEFM, KAØJEA, KAØMQA, KBØADH, KBØADG, KBØCHT, KBØFNM, KDØUE, WB4ETT, WB6YXD, WAØDGJ, WDØHNQ, WAØMNL, WBØMPH, WAØTAV, WBØTUB, WAØULE, WAØYNP.

There were so many amateurs involved from the Front Range of Colorado that it is difficult to have a complete list of all of their names and calls. But every amateur is to be commended for the excellent job done in this disaster. The distance traveled each day to provide the many man-hours of communications was a tremendous effort, and the services provided have shown to the public and to local and state officials the value of amateur radio and our capability for establishing and maintaining an effective emergency communications network within our own state of Colorado. *[Edie Sheffield, KAØMQA, 1444 Roslyn St., Denver CO 80220.]*



HONG KONG

Philip J. Weaver VS6CT
Flat 39C Two Park Towers
1 Kings Road
Hong Kong

Nearly a year has elapsed since I last wrote a note from Hong Kong. During that time I moved from the old flat I had been in for the last 13 years. I now reside on the top floor of a 39-story apartment block and it has taken me nearly a year to get the antennas in the photograph up and running, with the help of Brett VS6BG who shares with me. *[WOW! What a location!]*

Amateur activity in Hong Kong thrives and as of July we have 972 licensed amateurs in Hong Kong. 741 are Class "B" licenses, which was first introduced in April 1982, and 231 are Class "A" licenses. The majority of Class "B" holders are very active on 2 and 6 meters, and as such there has been considerable activity out of Hong Kong on 6 with quite a few firsts on 6 into Europe.

The Telecommunications section of the Post Office, which handles all amateur radio licensing in Hong Kong, has once again moved its offices. Now it's located on the 19th floor of the Sincere Building in Des Voeux Road Central In Hong Kong.

The issue of reciprocal and visitor's licenses are still as swift as always, and provided you come in with the right documentation, you can expect a call and receipt for the license fee (HK $150) to enable you to operate legally within 30 minutes. If you are not sure what is required or where to go, call me when you get into Hong Kong. Be sure that you bring your original license for the PMG people to see.

The Hong Kong Amateur Radio Transmitting Society (HARTS) still meets on the second Tuesday of every month at 1900 in the Volunteer Officers Mess on the 2nd floor of Beaconsfield House, next door to the Hilton Hotel. All guests are very welcome. The only other Society is the English Language Amateur Radio Transmitting Society (ELARCS), whose aim is to look after the interests of the expatriate community. It meets quarterly with a dinner, usually in one of Hong Kong's Yacht Clubs. For information call me on arrival at 887-6366, or write before you come and I can tell you when and where we shall next be meeting. Our annual dinner this year will probably be held about the 6th of December, and we would welcome any overseas visitors who may be in town.

I have had many inquiries as to what has happened to our 10 meter beacon which normally operates on 28.290. We had some bad luck on site and it is taking longer than expected to get it all up and running. However, the 6 meter beacon on 50.075 has been operating without a break for many years now. We hope that the 10 meter beacon will

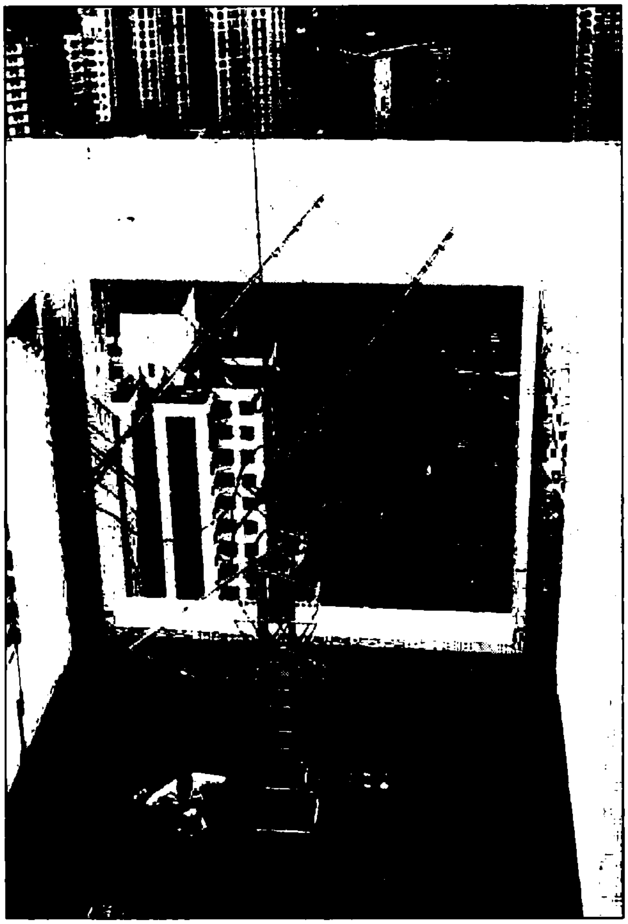


Photo A. *Philip Weaver VS6CT and his antenna. He now lives on the top floor of a 39-story apartment block in Hong Kong.*

be back on the air by the time this is printed. Hong Kong is one of the most frenetic cities in the world, and finding time after work and on the weekends to get other things done can be a problem.

At work I have been kept very busy getting the new satellite program up and running for the Cospas-Sarsat program. This is a very interesting sidelight to the use of NOAA low-orbiting satellites for the detection of transmissions from Emergency Position Indicator Radio Beacons (EPIRBs). Hong Kong has established the first Local User Terminal in the Far East, and as Search Coordinator for the South China Sea it is part of my section. Plus we are investigating the procurement of the necessary radio equipment for communicating with ships at sea under the Global Maritime Distress and Safety System (GMDSS) which will be implemented in February 1992.

There are now four 2-meter repeaters operating in Hong Kong, although only one, provided by ELARCS, uses the English language. If you want to get on the air with this one, you will need a CTCSS encoder/decoder on your radio. Call me for the code when you get here.

Until later, 73 de VS6CT, Philip Weaver. *[Philip's antennas in the photo are a 6 meter beam, 144/430 beams for satellites, and a Cushcraft R5 vertical for HF on the top.]*

LITHUANIA

Jonas Paskauskas LY2ZZ
PO Box 71
Siauliai 235400
Lithuania

The Lithuanian Amateur Radio Conference, which was canceled this year because of the political situation, has been rescheduled and will take place in June 1991. All problems with Visa applications should be straightened out by the end of this year. Anyone interested in attending this conference should contact me at the above address or on the World Lithuanian Amateur Radio Net meeting on weekends on 28.444 or 21.330 MHz at 1400–1500 UTC.

The first portable LY callsign, LY/W1ECK, was issued this spring to W1ECK as he was visiting Lithuania. Also, another portable LY callsign, LY/DL9HQ, was issued.

Any amateur planning a visit to Lithuania and wishing to obtain a portable callsign should send a copy of his license to me with the dates of the planned visit.

News from Latvia: I was told that YL portable callsigns are also being issued. To obtain them, write to The Minister of Communications, Riga, Latvia, and enclose a copy of your amateur radio license.

That's all from Lithuania at the moment. I hope to see many of you at the Conference in June.

SOUTH AFRICA

Peter Strauss ZS6ET
PO Box 35461
Northcliff
ZA-2115
Republic of South Africa

"Silent Key"

The new South African radio amateur novice licence became a reality for South Africa in June 1990. Negotiations between the administration and the South African Radio League started in 1969. A proposal outlining the framework for the new licence grade and suggested frequency ranges had been presented by the SARL negotiating team directly to the Postmaster General and senior officials of the licence authority.

South African radio amateurs had until recently only two licence grades: A—full (all privileges included) ZS licence requiring a technical, multiple choice exam and 12 words per minute Morse test, and a restricted ZR licence of the same technical exam level, but without any Morse test. The introduction of the restricted licence (no code licence) more than 20 years ago as a second licence class maintained compatibility with the licence grades in most of Europe and the Far East (except, e.g., Japan and the USA).

Today, tremendous progress has been made in the arena of international licence compatibility. Many member countries of CEPT, an umbrella organisation of European Telecommunications Authorities, no longer require written applications from foreign radio amateurs of signatory countries, and they permit mobile and portable amateur operation by means of a global multilateral operating agreement.

The third licence grade introduced in South Africa is not CEPT-compatible in many aspects, but aimed to promote electronics and telecommunications in a wide sense amongst young people. The 5 words per minute has been introduced in order to comply with the International Telecommunications Union (ITU) requirement that radio amateurs intending to operate below 30 MHz must be able to send and receive Morse code. The speed is left to the individual administration. The new licence reduced the minimum entrance age from 16 to 12 years. It was experienced that the age limit posed a problem in particular at a time when scholars were preparing for University entrance exams or high school final exams. This resulted often in opposition from parents who perceived the radio amateur exam as a "distraction" to their children.

In order to make the new licence attractive to the potential radio amateur, significant frequencies and operating modes have been included. Voice communication and data communications in the 70cm band provide access to the worldwide packet BBS network and local communications. Voice communication via an allocation on the 10 meter band encourages experimentation with antennae and home-brewing by converting CB radios and modifying CB antennas, etc., at very little cost. Regional communication via CW and data (RTTY and PACKET) in the 10 MHz band will permit the Novices in South Africa to communicate across the borders.

Photo B. *Tracy Strauss, enrolled for the new South African Novice licence, gets a feel of the keyboard for a future packet contact.*

In order to implement the main objectives (low entry age, easy technical exam and HF slices) concessions regarding the permissible output power had to be made *[5 watts modulation and 20 watts PEP]*. The resultant licence structure may be a model for many other developing countries intending to make a serious effort in the promotion of amateur radio. US amateurs should not forget that there are still many countries in Africa with only one licence grade, dating back to colonial days, effectively excluding local nationals from the amateur service in these countries.

The new South African Novice

licence will provide an entry to the amateur service to all population groups and an opportunity to find an interest in electronics as a vocation in later life. By the time you read these lines you may well want to keep a lookout for the new ZU1 callsign prefix allocated to the South African Novices.

Enclosed is a photo of Tracy, Susan's and my daughter. She is enrolled for the Novice license and is getting a feel of the keyboard in preparation for packet radio. *[Peter enclosed the main features of the new licence but there is not room here to print them. Look for them on the 73 BBS. Frequencies on which a Novice may transmit are portions of: 160m, 80m, 30m, 15m, 10m, and 70cm, with differing modes of transmission.]*

SPAIN

Woodson Gannaway N5KVB/EA
Apartado 11
35450 Santa Maria de Guia
(Las Palmas de Gran Canaria)
Islas Canarias
Spain

Good news for four of the members of Union de Radioaficionados Las Palmas (URL) in the Canary Islands. They were advised that they had won their class in the Associazione Radioamatori Italiani (ARI) International DX Contest.

The four contesters are all active members of the URL. Elsa EA8BVH has been an amateur since September 1988, and in this short time she has won almost every Spanish contest in which she has participated. She has also won the Canary Island of Africa part of most of the foreign contests she has participated in.

Isabel EA8BSJ has been an active amateur since 1985 and a successful contender from the first. But since 1988 she has sat out the contests in order to help Elsa develop, sharing her experience in all areas of contesting. She is also working on a book about worldwide contesting.

Marcos EA8BIK is the URL Secretary and an active planner and participant for all kinds of activities. He is also a good contest operator. In this contest he took care of attendance.

Leon EA8BSI teaches electricity and electronics at the URL. He is also a good contester (in the last ARRL contest he logged 2,940 contacts in 48 hours). In this contest he handled the antennas, equipment, and the kitchen.

A future story that I am trying to chase down are the plans of a commemorative sailing of Columbus's three little ships that sailed to the United States of America about 500 years ago. The sailing will be in 1992, and I understand that things are starting to happen. If anybody in Spain has any information, please send it to me.

Congratulations to the contesters and best wishes to all! 73 de Woodson, N5KVB/EA.

Number 30 on your Feedback card

UPDATES

July QRP

I noticed an error with the schematic in the "QRP" section in the July 1990 issue. This error will blow the fuse each time power is applied. You cannot wire the secondary of a transformer in that manner to get more current. If you want to get more current, you need two identical secondary windings, and you must phase them so that they don't fight with each other (see the corrected portion of the schematic below).

Also, the author noted that he "...wired both 14.8 volt secondaries in parallel. This increased the current to the bridge...and the extra current helped keep the voltage stable under load." That would be true HAD he wired the secondaries in parallel. But he noted earlier that "...14.8 volts was a bit low for the regulator," and he is correct in that most voltage regulators require at least 5 volts differential. *TNX Glen Closson N6PQP.*

Field-Strength Meter

Ray Kent KM4KT, the author of "Quick and Easy Field-Strength Meter" in the September 1990 issue of *73*, notes that for greater sensitivity, you can eliminate R1. *TNX KM4KT.*

Portable 100 BBS

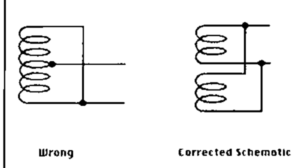
See the letters column in the August issue. The phone number for the *Portable 100* BBS should be (603) 924-9770. *TNX Nuge.*

June Ham Profiles

From Joel Mendes Pinto PT2KU: "Thanks for the note my friend Gil AL7KU sent you about our eyeball QSO in my QTH in the June issue.

"There is a little correction which is very important to me: The design of T-shirts was for the first 2m group in Brasilia (the capitol), not Brazil. Also, in 1975 I set up the first 2m station in Brasilia, not Brazil.

"Many hams from São Paulo, Rio de Janeiro, and other cities, were the true pioneers years ago, on 2m works." *TNX PT2KU.*



Correction for the QRP schematic in the July 1990 issue.

Number 38 on your Feedback card

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS. Use upper- and lower-case let- ters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters 1 or i, or even the number 7. Thank you for your cooperation.

Blind, handicapped, house-bound ham with arthritis for 20 years wants to hear from people, and seeks a portable shortwave radio, such as a Sony Model 2010. If you could help me, please write or phone. I welcome letters. *Richard Jastrow. 5909 W. 6th St., Los Angeles CA 90036, phone (213) 938-5347.*

Looking for Teletype Bulletins 120B, 1167, 251B, and 254B. *Charles T. Huth, 229 Melmore St., Tiffin OH 44883. (419) 448-0007.*

I need a schematic or manual on RF Communications, Inc. HF Transceiver Model RF-301, made in the USA 20 years ago. I will copy and pay all postage. *Jesus Gonzalez CO2DC, Box 6681, Havana 6, Cuba.*

I am in need of information concerning construction of a Jacob's Ladder. A friend of mine at work wants to build one for a science project with his son. Thanks for any help. *Eric Johnson KM4ZL, 105 Kentwood Dr., Daphne AL 36526.*

I am interested in packet radio, especially TCP/IP (snmtp) but am having a heck of a time getting going. I am interested in setting up equipment, donating time and money and working with others to set up a reliable high speed digital backbone. Anyone else interested? Let's do it. *Tommy B, (309) 888-4184 or wd0eib@wd8drm.il.usa.na.*

I would like to hear from anyone who has any programs regarding amateur radio for the Atari 800 or 800 XL computer. *Greg Lotoczky, PO Box 4412, Centerline MI 48015.*

Needed: Technical manual or any other description of Hallicrafters type HLA-KA amplifier. *Rag Otterstad OZ8RO, Vejdammen 5, DK-2840 Holte, Denmark.*

Number 31 on your Feedback card

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston TX 77083

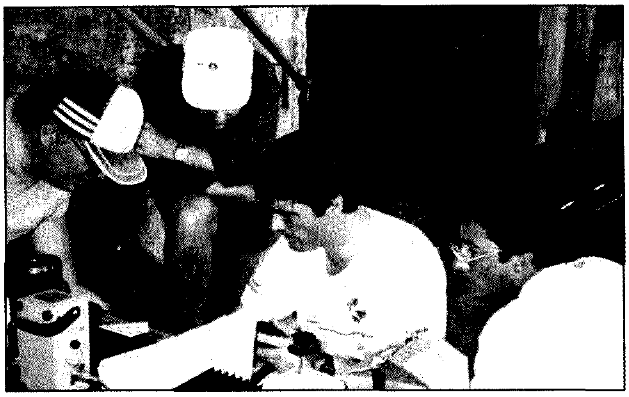


Photo A. Field Day 1990: WA5ZIB at the satellite station while WA5LHM, WB5HLZ and Greg Rice watch.

New "Hamsat" in Orbit

On July 16th of this year, Pakistan joined the ranks of those countries with satellites transmitting within the amateur bands. Launched on a Chinese Long March rocket, BADR-1 was lofted into a low-inclination elliptical orbit. Many stations were surprised when UoSAT-type data was heard unexpectedly on 145.825 MHz FM.

Early information from Dr. Martin Sweeting at the University of Surrey in England indicated that the satellite was sponsored by SUPARCO, the Pakistani Space and Upper Atmosphere Research Commission. The orbit has a perigee (low point) only 200 km up, while the apogee (high point) of the orbit is nearly 800 km. It is not known if the satellite builders expected this orbit—the low perigee will limit the lifetime in orbit to about six months before the satellite's fiery re-entry.

During the first two days of life in orbit, BADR-1 telemetry on 145.825 MHz sounded like UoSAT-OSCAR-11, but the data was apparently unintelligible—repeating HEX numbers at 1200 baud using tones similar to the Bell 202 standard. Later only a single 2200 Hz tone with no apparent data was monitored on the downlink. The satellite has also been heard on 144.028 MHz.

Dr. Abdul Majid of SUPARCO reports that BADR-1 is well and is undergoing tests. He expected full operation including digital communication experiments by early August. Orbital-element information is available from AMSAT nets and packet radio news releases for use with commonly available computer tracking software.

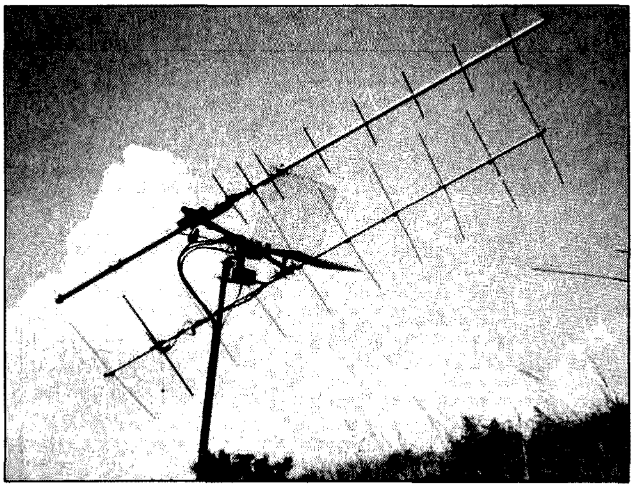


Photo B. Field Day hamsat antennas at N5EM—simple but effective.

The Decay of A-O-13

Earlier this year, Victor Kudielka OE1VKW published an article in *AMSAT DL Journal* from West Germany concerning premature decay of the orbit of AMSAT-OSCAR 13. Subsequent studies here in the U.S. and overseas yielded wildly divergent estimates on the date for A-O-13's demise, ranging from 1992 to 1997. Most hams found it hard to believe that an orbit with a perigee of 2500 km like A-O-13's would ever decay.

A statement from Dr. Karl Meinzer DJ4ZC, one of A-O-13's designers and President of AMSAT DL, pointed out that elliptic orbits with high inclinations are potentially unstable due to the gravitational effects of the sun and moon. The Soviets discovered this years ago when some of their Molnija satellites (in high elliptic orbits) prematurely re-entered the atmosphere because of these effects.

Prior to the launch of A-O-13, AMSAT was aware that the orbit could be unstable so they increased the perigee from the target value of 1500 km to 2500 km during the second orbit-adjustment kick-motor firing early in the satellite's life. This was done to provide an extra margin of safety to the orbit. Since then, the perigee has been declining faster and farther than anticipated, currently losing nearly a kilometer per orbit.

The new studies show that the original calculations were either too coarse or that the slight changes of the moon's orbit adversely affected A-O-13's orbit, but all the news is not bad. Current estimates show that A-O-13 will experience a perigee low around 500 km in July 1992. The perigee will rise to about 750 km in November 1993 and re-entry is not expected until 1996 or later. The satellite's batteries or other critical components could fail due to age and the rigors of space before its toasty end in the atmosphere. Details on the orbital studies will be presented in Houston, Texas, at the Johnson Space Flight Center on October 20, 1990, during the AMSAT Annual Meeting and Space Symposium. Contact AMSAT at (301) 589-6062 if you would like to attend.

Satellites are a limited resource. Work is already underway for Phase 3D (an upgraded version of A-O-13) in West Germany. Launch is expected before 1996.

DOVE—On Again, Off Again

AMSAT engineers made great strides toward the recovery of DOVE-OSCAR-17 during July. While it was hoped that the satellite would be talking by late June, curious software crashes plagued the efforts. Dr. Bob McGwier N4HY determined that the main difficulty was due to a hardware problem within the satellite.

During software uploads to DOVE, data was being correctly received but acknowledgment packets from the on-board computer were not being transmitted back to Earth by the S-band transmitter. Bob and Harold Price NK6K have tailored their software to work around this problem.

When DOVE was heard on 145.825 MHz in late July, listeners hoped that full recovery was at hand. It was not. DOVE again became silent just a few days later. This time the problem was simply incorrect commands from the ground.

Since the almost-fatal system crash in March when the 2-meter transmitter was locked on, a "watchdog" timer has been incorporated into the software. If the satellite does not receive the proper commands from a control station within three days, the 2 meter transmitter is turned off and the satellite goes into a "safe" mode where only the S-band transmitter is energized.

DOVE never received the proper timer reset commands, so it shut down. This hamsat and the other Microsats are complex devices. Troubleshooting them on a bench in a lab would be difficult. Solving problems and doing diagnostics with the patient circling the Earth hundreds of miles up makes the situation even more exasperating and challenging. The AMSAT-NA Microsat team has demonstrated remarkable creativity and ingenuity as they work toward fully functional Microsats in orbit.

Field Day 1990

Last month I focused on portable and mobile RS-10 Mode A (2 meters up and 10 meters down) activity. Field Day was the perfect opportunity to try out portable systems. Our own group in South Texas at the Fort Travis Sea-

Photo C. Setting up for OSCAR activity at a Boy Scout Camporee in Texas. (Photo by N5DIB.)

Photo D. KE5SR (far left) helps scouts make contacts via 2 meters, prior to tuning in A-O-13. (Photo by N5DIB.)

shore Park on Bolivar Peninsula near Galveston did just that. With a basic array of Cushcraft antennas and various rigs, including a Yaesu FT-726R and a Yaesu FT-736R, we had many enjoyable contacts through AMSAT-OSCAR 10, A-O-13 and RS-10. Fuji-OSCAR 20 was not available for Mode JA (2 meters up and 70 cm down) analog activity and we did not have any digital equipment beyond the simple packet system for 2 meter terrestrial work. The Mode B (70 cm up and 2 meters down) transponder on A-O-13 sounded like 20 meters during a DX contest.

The Mode L (23 cm up and 70 cm down) transmit system at our location was not sufficient for any QSOs via the satellite, but it did provide a nice ATV contact on 1289 MHz with NI5I across the bay. Last year we had a four-foot dish with a circularly-polarized feedhorn and 35 watts through 20 feet of Belden 9913 coax. This year, the power was the same but the feedline was longer and the antenna was a linearly-polarized modified corner reflector. Less antenna gain and more transmission line losses added up to no contacts. Next year will be different. We'll be using a combination 1.2/2.4 GHz feed system and a six-foot dish.

There are other opportunities during the year for portable activity. Many Boy Scout camporees and demonstrations provide an excellent environment for experimenting and demonstrating satellite operation with simple systems.

Bob Schaer N5DIB got Scouts involved with 2 meter and 70 cm satellite antenna construction. They used wooden tent poles lashed together for the mount and adjusted the elevation while monitoring a simple Sears inclinometer and checking azimuth with a Boy Scout issue compass. Keeping the antennas just clear of the ground during pointing is all that is required for hamsat contacts when the path to the sky and the desired satellite is clear. With today's solid-state radios, a large car or deep-cycle battery can run everything.

Even less is required for RS-10 activity via Mode A. A simple omni antenna for the 2 meter uplink and a dipole for the 10 meter downlink takes care of the antennas, while a multimode 2 meter transceiver and an HF rig cover the equipment needs.

Check last month's "Hamsats" for details on simple but effective installations. 73

Number 32 on your Feedback card

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

Digital Dithers

Does the word "confused" mean anything to you? How about "befuddled" or "frustrated?" If not, you may never have been in the position of an amateur venturing into digital communications for the first time.

Let me take a case in point. I just received a letter from Curtis L. Shiffer WD0ELK of Des Moines, Iowa, which kind of sums things up. Curtis writes:

I built a terminal unit for RTTY several years ago, but [it] was very hard to tune in RTTY, and [I] never got it to receive. I purchased an MFJ-1274 about a year ago. I can receive OK if I tune properly, and know where to look for RTTY. I am not real up on this mode. I have never been able to transmit with [the] MFJ-1274.

I am using a Swan 700CX. I double-checked the cabling to the radio and computer. Does the timing on tube transmitters give a problem on transmit? Also, I would like to get on AMTOR. Will the Swan work on AMTOR, and do I need another software program? I am using a C-64 computer. . . .

I was told by a dealer that if I got a software program for AMTOR, I would also have to get a newer, solid state, transmitter. If so, I would like to know what other hams are using for RTTY and AMTOR.

I also have [another] MFJ-1274 that I use with another C-64 on packet, with an ICOM 2AT. It works OK on transmit and receive into W0AK club station and the KC0KZ BBS.

Controllers

First marketed about three or four years ago, the MFJ-1274 was one of the first high quality packet controllers on the market. A clone of the TAPR TNC-2, this commercial unit took the bare board, cleaned it up a tad, and put it in a box, complete with power supply, serial port, battery backup, and an LED tuning indicator.

Able to run both VHF and HF protocols, this unit put packet in reach of anyone with a computer and a radio. Software programs were offered for the VIC-20, a very low cost (for 1987) computer, as well as the C-64. Further, the ability to use any ASCII controller, and promises of software updates, intimated a long life for the MFJ-1274.

But remember, this is a PACKET terminal unit, *not* a RTTY unit! You cannot tune in RTTY with this unit because it is looking for packet protocols, not five-level RTTY signals. Having covered this topic before in this column, I won't go into it again at this time. But if you need to look at the different signals available in the digital spectrum, don't be afraid to ask!

Transmitters for RTTY

Now, as to the question of the transmitter. Tube vs. solid state, that is the question, hmm? Well, not really. The real issue is, how fast can your transceiver, or transmitter and receiver, switch from receive to transmit, or from transmit to receive?

You see, when transmitting a mode like AMTOR, you need frequent, rapid transitions from receiving to transmitting and back. This is due to the need to acknowledge the little packets of characters as they are sent, in this error-correcting mode. Similarly, packet radio protocols require the receiver to send acknowledgment of a received packet. If your transmitter cannot come up on the air quickly enough, you may lose the communications link. That, in a nutshell, is the difficulty with older transmitters.

While going out and buying a new transmitter is wonderful if you have the money, it is not always necessary. You may be able to coerce the old transmitter on the air by reducing power, narrowing a relay gap, or changing the values of some of the switching components. If you ask around on the air, someone with a rig just like yours is sure to have faced whatever problem you have with it. I had such luck when I was looking for the cause of a relay hang-up in an old transmitter of mine.

Failing all that, sure, go out and buy a new solid state rig. Just don't tell your wife (mother, significant other) that I told you to do it!

Look Into It

I don't know if there is an upgrade for the MFJ-1274, to add other modes to it, but you might drop a line to MFJ Enterprises, Inc., at P.O. Box 494, Mississippi State, MS 39762; or call them at (601) 323-5869. Another question is whether you can trade the MFJ-1274 in on the newer MFJ-1278 multimode controller, which does all you want, and more! Of course, be sure to mention *73 Magazine's* "RTTY Loop" when you call.

As to the question of what computers other hams are using, every time I ask that one, I run out of paper trying to tally the response. I'm going to go out on a limb and say now that, from what I've heard and read, about half of the amateurs are using a MS-DOS or PC-DOS computer, about a quarter to a third are using one of the Commodore series (VIC-20, C-64, C-128), and the rest are scattered among Radio Shack CoCo's, TI 99/4s, Apples, Macs, and who knows what else.

As to radio equipment, most appear to be using modern HF solid state stations. I'd be interested in hearing about how many old clunkers are still on the air. I have an old phasing type SSB rig that I had on RTTY for many years. I liked it because it would run, key-down, for hours on end. Of course, the table began to sag under its weight after a couple of years!

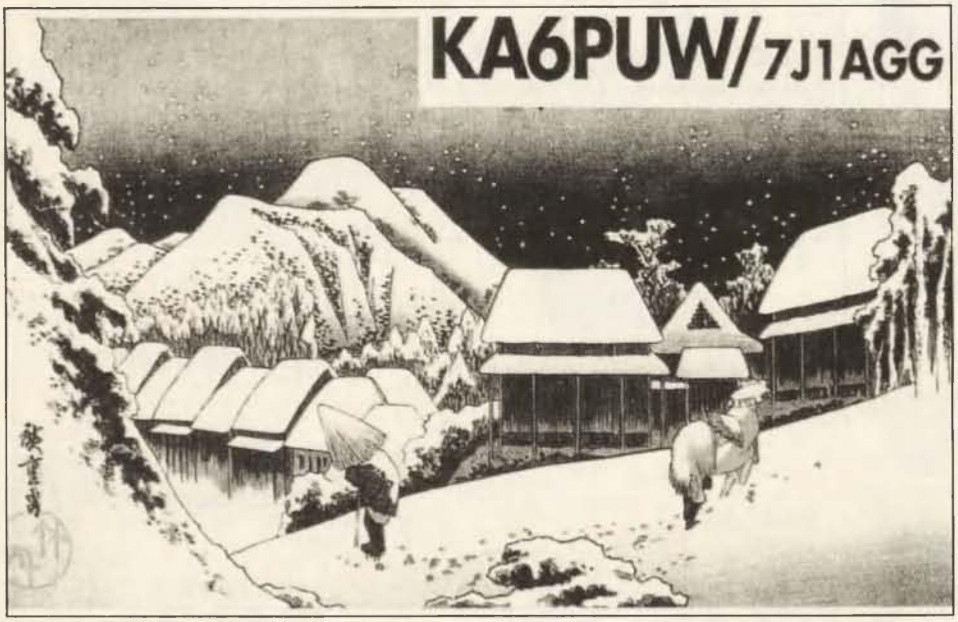
One high tech note this month. I recently upgraded the computer at WA3AJR from the old 8088 to one a bit more speedy, and discovered that an interface board would not fit in the new computer. I don't know how prevalent this situation is, but I suspect as more amateurs move to higher power computers, this might become a problem. I have a letter out to the manufacturer, and I hope to report on the outcome next month. For now, I would be interested in hearing about any such incompatibilities, on a hardware or software level, from you all.

As you can see, we try to respond to your questions, wants, and needs in RTTY Loop. The territory we cover ranges from five level Baudot to five disk hard drives, with anything in between fair game. Let me hear from you, with your thoughts on this world of digital communication. Send mail to the address in the banner, or Email via CompuServe to ppn 75036,2501, or via Delphi to username MARCWA3AJR. I look forward to hearing from you. 73

Official DX Dynasty Countries Updates and Corrections: 10-01-90

Thanks to Bob Reed WB2DIN, DX Dynasty Awards Manager

ABU AIL	A15
AFGHANISTAN	YA
AGALEGA ISLAND	3B6
ALAND ISLANDS	OHØ
ALASKA	KL7
ALBANIA	ZA
ALDABRA ISLAND	VQ9
ALGERIA	7X
AMERICAN SAMOA	KH8,AH8
AMSTERDAM ISLAND	FT8
ANDAMAN ISLAND	VU4
ANDORRA	C3
ANGOLA	D2
ANGUILLA	VP2E
ANNABON ISLAND	3CØ
ANTARCTICA	KC4
ANTIGUA	V2
ANTIPODES ISLAND	ZL
ARAN ISLAND	EJØ
ARGENTINA	LU
ARMENIA	UG
ARUBA	P4
ASCENSION ISLAND	ZD8
AUCKLAND ISLAND	ZL4/A
AUSTRAL ISLANDS	FO
AUSTRALIA	VK
AUSTRIA	OE
AVES ISLAND	YVØ
AZERBAIJAN	UD
AZORES ISLANDS	CT2
BAHAMA ISLANDS	C6
BAHRAIN	A9
BAKER ISLAND	KH1
BALEARIC ISLANDS	EA6
BANABA ISLAND	T33
BANGLADESH	S2
BARBADOS	8P6
BEAR ISLAND	JW
BELGUIM	ON
BELIZE	V3
BENIN	TY
BERMUDA	VP9
BHUTAN	A5
BOLIVIA	CP
BONAIRE	PJ9
BONIN	JD1
BOPHUTHATSWANA	H5
BOTSWANA	A2
BOUNTY ISLAND	ZL
BOVET ISLAND	3Y
BRAZIL	PP-PY
BRIT CYPRUS	ZC
BRITISH VIRGIN ISLANDS	VP2V
BRUNEI	V8
BULGARIA	LZ
BURKINA FASO	XT
BURMA	XZ
BURUNDI	9U
BYELORUSSIA	UC
CAMEROON	TJ
CAMPBELL ISLAND	ZL4/A
CANADA	VE
CANARY ISLANDS	EA8
CAPE VERDE ISLANDS	D4
CAPRI ISLAND	IC
CAYMAN ISLANDS	ZF
CELEBES	YB
CENTRAL AFRICAN REPUBLIC	TL
CENTRAL KIRIBATI	T3
CEUTA AND MELLIA	EA9
CHAD	TT
CHAGOS	VQ9
CHATHAM ISLAND	ZL
CHESTERFIELD ISLAND	FK8
CHILE	CE
CHINA	BY
CHRISTMAS ISLAND	VK9X
CISKEI	S4
CLIPPERTON ISLAND	FOØ
COCOS ISLAND	TI9
COCOS KEELING ISLAND	VK9Y
COLOMBIA	HK
COMINO IS	9H
COMOROS	D6
CONGO	TN
CONWAY REEF	3D2
COOK ISLAND	ZK1
CORSICA	TK
COSTA RICA	TI
CRETE	SV9
CROZET ISLAND	FT8W
CUBA	CO
CURACAO	PJ
CYPRUS	5B4
CZECHOSLOVAKIA	OK
DENMARK	OZ
DESECHEO ISLAND	KP5
DESROCHES	VQ9
DIEGO GARCIA	VQ9
DJIBOUTI	J2
DODECANESE ISLANDS	SV5
DOMINICA	J7
DOMINICAN REPUBLIC	HI
EAST CAROLINE ISLANDS	KC6
EAST GERMANY	Y2
EAST KIRIBATI	T3
EASTER ISLAND	CEØ
ECUADOR	HC
EGYPT	SU
EL SALVADOR	YS
ENGLAND	G
EQUATORIAL GUINEA	3C
ESTONIA	UR,ES
ETHIOPIA	ET
EUROPA ISLAND	FR/E
FALKLAND ISLANDS	VP8
FAROE ISLANDS	OY
FAROUHAR	VQ9
FERNANDO DE NORONHA	PYØF
FIJI ISLANDS	3D2
FINLAND	OH
FRANCE	F
FRANZ-JOSEF LAND	UA1
FRENCH GUIANA	FY
FUTUNA ISLAND	FW
GABON	TR
GALAPAGOS ISLAND	HC8
GAMBIA	C5
GEORGIA	UF
GHANA	9G
GIBRALTAR	ZB2
GLORIOSO ISLAND	FR/G
GOUGH ISLAND	ZD9
GOZO ISLAND	9H4
GRAHAM LAND	VP8
GREECE	SV
GREENLAND	OX
GRENADA	J3
GROSSE ILE	CYØ
GUADELOUPE	FG
GUAM	KH2
GUANTANAMO BAY	KG4
GUATEMALA	TG
GUERNSEY	GU
GUINEA	3X
GUINEA-BISSAU	J5
GUYANA	8R1
HAITI	HH
HAWAII	KH6
HEARD ISLAND	VKØ
HONDURAS	HR
HONG KONG	VS6
HOWLAND ISLAND	KH1
HUNGARY	HA
ICELAND	TF
IFNI	EA9
INDIA	VU
INDONESIA	YB
IRAN	EP
IRAQ	YI
IRELAND	EI
ISCHIA	IC
ISLE OF MAN	GD
ISRAEL	4X
ITALY	I
IVORY COAST	TU
JABAL ATTAIR	??
JAMAICA	6Y
JAN MAYEN ISLAND	JX
JAPAN	JA
JARVIS ISLAND	KH5J
JAVA	YB
JERSEY	GJ
JOHNSTON ISLAND	KH3
JORDAN	JY
JUAN DE NOVA ISLAND	FR/J
JUAN FERNANDEZ ISLAND	CEØ
KALININGRAD	UA2
KAMARAN ISLAND	VS9
KAMPUCHEA	XU
KAREN NATIONAL UNION	1Z9
KAZAK	UL
KENYA	5Z
KERGUELEN ISLAND	FT8X
KERMADEC ISLAND	ZL1/K
KINGMAN REEF	KH5K
KIRGHIZ	UM
KOREA	HL
KURE ISLAND	KH7
KUWAIT	9K
KWAJALEIN	V73
LABRADOR	VO2
LACCADIVE ISLANDS	VU7
LAMPEDUSA ISLAND	IG
LAOS	XW
LATVIA	UO
LEBANON	OD
LESOTHO	7P
LESSER ANTILLES	PJ
LEVANZO ISLAND	IF9
LIBERIA	EL
LIBYA	5A
LIECHTENSTEIN	HBØ
LINE ISLANDS	T3L
LITHUANIA	UP
LORD HOWE ISLAND	VK2
LUXEMBOURG	LX
M-V ISLAND	4J1
MACAO	XX
MACOUARIE ISLAND	VKØ
MADAGASCAR	5R
MADDALENA ISLAND	IM
MADDONA DE MONTE IS	IL
MADEIRA ISLAND	CT3
MALAWI	7Q
MALAYSIA	9M2
MALDIVE ISLANDS	8Q
MALI	TZ
MALPELO	HKØ
MALTA	9H
MANIHIKI	ZK1
MARCUS ISLAND	JD
MARIANA ISLAND	KHØ
MARION ISLAND	ZS2
MARKET REEF	OJØ
MARQUESAS ISLAND	FO
MARSHALL ISLANDS	V73
MARTIM VAS ISLAND	PYØ
MARTINIQUE	FM
MAURITANIA	5T
MAURITIUS ISLAND	3B8
MAYOTTE	FH
MEXICO	XE
MIDWAY ISLAND	KH4
MINAMI TORI SHIMA	JD1
MIQUELON ISLAND	FP8
MOLDAVIA	UO
MONACO	3A
MONGOLIA	JT
MONSERRAT	VP2M
MOROCCO	CN
MOUNT ATHOS	SY
MOZAMBIQUE	C9
NAMIBIA	V51
NAURU	C2
NAVASSA ISLAND	KP1
NEPAL	9N1
NETHERLANDS	PA
NETHERLANDS ANTILLES	PJ
NEVIS ISLAND	V47
NEW CALEDONIA	FK
NEW HERBRIDES	YJ
NEW ZEALAND	ZL
NEWFOUNDLAND	VO1
NICARAGUA	YN
NICOBAR ISLAND	VU4
NIGER	5U
NIGERIA	5N
NIUE ISLAND	ZK2
NORFOLK ISLAND	VK9N
NORTHERN IRELAND	GI
NORWAY	LA
OGASAWARA ISLAND	JD1
OKINO TORI SHIMA	7J
OMAN	A4
PAKISTAN	AP
PALMYRA ISLAND	KH5
PANAMA	HP
PANTELLERIA ISLAND	IH
PAPUA NEW GUINEA	P2
PARAGUAY	ZP
PENGUIN ISLANDS	ZS9
PERU	OA
PETER 1ST ISLAND	3Y
PHILIPPINES	DU
PHOENIX	T3P
PITCAIRN ISLAND	VR6
POLAND	SP
PONZIANI ISLAND	IBØ
PORTUGAL	CT
PRINCE EDWARD ISLAND	ZS2
PRINCE EDWARD ISLANDS	VE1
PRINCIPE	S9
PRIVILOF	KL7
PROVIDENCIA ISLAND	HKØ
PUERTO RICO	KP4
OATAR	A7
RAPA ISLAND	FO8
REUNION ISLAND	FR/R
REVILLA GIGEDO ISLAND	XF4
RIO DE ORO	EA9
RODRIGUEZ ISLAND	3B9
ROMANIA	YO
RONCADOR CAY	HKØ
ROTA ISLAND	KH2
ROTUMA ISLAND	3D2
RUSSIA—SIBERIA	UA9-Ø
RUSSIAN S.F.S.R.	UA
RUSSIAN-URAL MT	UA9-Ø
RWANDA	9X
RYUKYU ISLAND	JR6
SABA ISLAND	PJ
SABAH	9M6
SABLE ISLAND	VE1
SAIPAN	KH2
SAKHALIN ISLAND	UA9-Ø
SAN ANDRES ISLAND	HKØ
SAN FELIX ISLAND	CEØX
SAN MARINO	T7
SAO TOME	S9
SARAWAK	9M8
SARDINIA	IS
SAUDIA ARABIA	HZ
SCOTLAND	GM
SENEGAL	6W
SERRANA BANK	HKØ
SEYCHELLES	S79
SICILY	IT9
SIERRA LEONE	9L
SINGAPORE	9V
SINT EUSTATIUS	PJ
SINT MAARTEN ISLAND	PJ
SMOM (MALTA)	1AØ
SOCIETY ISLAND	FO8
SOCOTRA ISLAND	7O
SOLOMON ISLANDS	H44
SOMALI REPUBLIC	T5
SOUTH AFRICA	ZS
SOUTH GEORGIA ISLAND	VP8
SOUTH ORKNEY ISLAND	VP8
SOUTH SANDWICH ISLAND	VP8
SOUTH SHETLAND ISLAND	VP8
SOUTH YEMEN	7O
SPAIN	EA
SPRATLY ISLAND	IS
SRI LANKA	4S
ST BRANDON ISLAND	3B7
ST HELENA ISLAND	ZD7
ST KITTS	V44
ST LUCIA	J6
ST MARTIN ISLAND	FS
ST PAUL ISLAND	FT8
ST PETER & PAUL ROCKS	PYØ
ST PIERRE ISLAND	FP8
ST VINCENT	J8
SUDAN	ST
SUMATRA	YB
SURINAM	PZ
SVALBARD ISLAND	JW
SWAN ISLAND	HRØ
SWAZILAND	3D6
SWEDEN	SM
SWITZERLAND	HB
SYRIA	YK
TADZHIK	UJ
TAIWAN	BV
TANZANIA	5H3
TASMANIA	VK7
THAILAND	HS
TINIAN	KHØ
TOGO	5V
TOKELAU	ZM7
TONGA ISLAND	A3
TRANSKEI	S8
TRANSVAAL	T4
TRINIDAD & TOBAGO	9Y
TRINIDADE ISLAND	PYØ
TRISTAN DE CUNHA	ZD9
TROMELIN ISLAND	FR/T
TUAMOTU ARCHIPELAGO	FO8
TUBUAI	FO8
TUNISIA	3V
TURKEY	TA
TURKMEN	UH
TURKS & CAICOS ISLANDS	VP5
TUSCAN ARCHIPELAGO	1A
TUTUILA ISLAND	KH8
TUVALU	T2
UGANDA	5X
UKRAINE	UB
UNITED ARAB EMIRATES	A6
UNITED NATIONS—GENEVA	4U1
UNITED NATIONS—NEW YORK	4U1
UNITED NATIONS—VIENNA	4U1
UNITED STATES	W
URUGUAY	CX
USTICA ISLAND	IE9
UZBEK	UI
VANUATU	YJ
VATICAN CITY	HV
VENEZUELA	YV
VIETNAM	XV
VIRGIN ISLANDS	KP2
WAKE ISLAND	KH9
WALES	GW
WALLIS ISLAND	FW
WALVIS BAY	ZS9
WAYNE GREEN	W2NSD
WEST CAROLINE ISLAND	KC6
WEST GERMANY	DL
WEST KIRIBATI	T3
WESTERN SAHARA	SØ
WESTERN SAMOA	5W1
WILLIS ISLAND	VK9Z
WORLD BANK	4U1
YEMEN	4W
YUGOSLAVIA	YU
YUKON	VY1
ZAIRE	9Q
ZAMBIA	9J
ZANZIBAR	5H1
ZIMBABWE	Z21



QSL of the Month To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock, NH 03449. Attn: QSL of the Month. Winners receive a one-year Subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

Never Say Die

Continued from page 4

The Goal

For the Alzheimer's stricken geriatrics, the purpose of this exercise is twofold. We need new directors running the League so they'll (1) establish a task force to clean up our bands. Talk about trash! All you have to do is tune 14,313 and listen to Herb and his amateur radio wrecking crew to see how bad things have gotten. And (2) establish a task force to get newcomers into the hobby.

Can these goals be achieved with president Price and the current directors? They've had years to make a move and we haven't seen anything but talk.

So let's see some action toward the first real ARRL elections in the League's history.

Why Bother?

Let me replay Wayne's old tune. It may have totally escaped you that we have lost our consumer electronics industry. . . that America no longer manufactures the billions of dollars of hi-fi's, TVs, radios, cassette players, boomboxes and calculators which Japan has parlayed into the world's greatest financial empire. We buy their radios and they buy CBS.

This manufacturing loss means we've in turn lost the supporting industries such as parts manufacturing and the continuing research support which all this manufacturing required. Indeed, the evidence is strong that the sudden lack of young hams in the late '60s and early '70s, the League's contribution via their disastrous Incentive Licensing strategy, so weakened American research strength that the Japanese were able, through their no-code licensing move, to capture our consumer electronics industry.

A manufacturing industry, without new product research to support it, doesn't last long.

Now, with cars depending more and more on electronics, even our automotive industry is being seriously hurt by our shortage of new engineers, technicians and scientists.

If we can get the League to take this situation seriously and gear up to attract newcomers to amateur radio, we're going to need at least 50,000 new young hams a year before we'll even have a prayer of regaining our electronic industries.

The key to getting this revolution going is to dump the old guard directors and vote in new ones. Yes, I know, it's too much trouble. The Russian (socialist) answer to every new idea is the same: (1) It can't be done, and (2) We're tired.

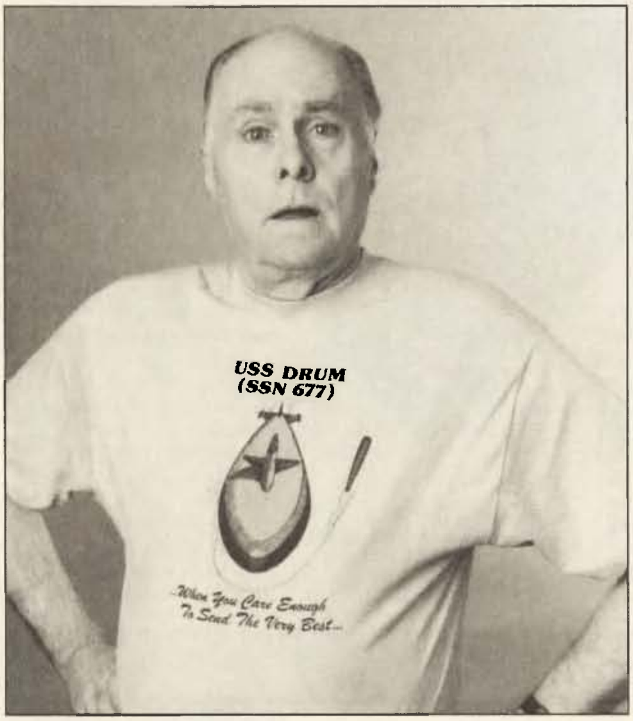
Are you really too frightened and tired to let me know what's going on in your division so I can help you clean house?

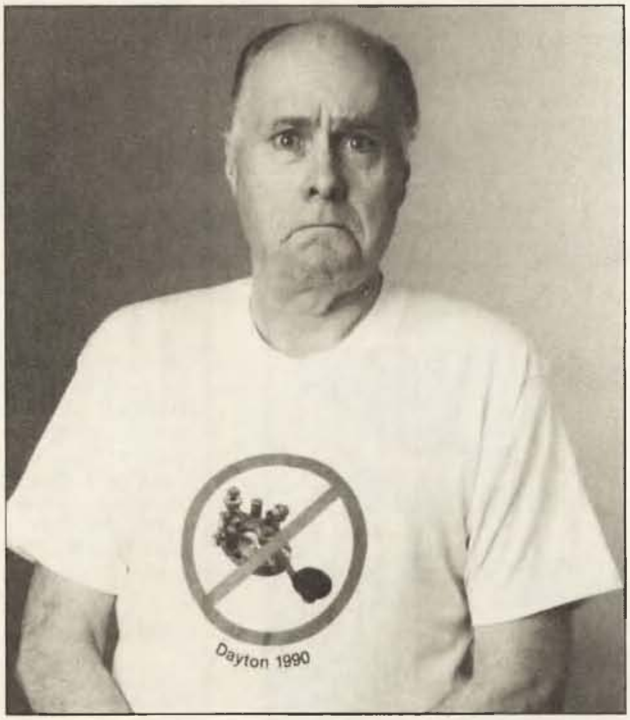
Do It Yourself?

This "trashing" of the ARRL by suggesting you get them to do the most logical and needed thing is a last ditch act. I've come up with this outrageous and probably completely unworkable idea in desperation.

First I wrote editorials asking you to do something about the mess on our bands and repeaters. I asked you either to take individual responsibility and actually go on the air and try to reason with the handful of crazies who are screwing up amateur radio for the rest of us. . . or to at least get your club interested in a group attempt to clean up the mess you've allowed to build up.

Okay, I wrote about it at length and





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then I waited. I listened on the air for any signs that one single reader or ham club was showing the slightest hint of social responsibility. I anxiously read every club newsletter coming my way, looking for any sign of intelligent life in the ham universe. Zilch. Nothing. Bubkes.

I went on a several year rampage trying to get any reader or club to take seriously our need to attract youngsters into our hobby. I cajoled. I wept. I threatened. I raged. I even tried logic. And what did I get for all my trouble? A few "hey, right on" letters. Some letters asking me to stop bothering you with facts. And a continued downslide in the FCC statistics.

If I see ARRL director Marshall Quiat re-elected this year I'll know for sure that there isn't one ham in the entire Rocky Mountain Division with any real interest in amateur radio's future. . . that this whole thing is completely, totally hopeless. I can't believe there isn't anyone in the whole division with enough pride in our hobby to stop such a travesty.

20 Meters Poisoned!

The self-righteous officious bullies, lead by KV4FZ, started their poisoning on 14,313. But this mean-spirited hatemongering soon spread to 14,300 and then 14,275. It further festered when all-mouth, no-ears K1MAN entered the fray.

We'd already had complaints by the gross over Glen (MAN)'s endless blind broadcasts on 14,275. It was bad enough that W1AW, run totally by a computer, fired up to broadcast messages day and night on the bands; now hams seemingly more interested in ego gratification than being of any serious service were getting into the act.

The 14,313 mess naturally spread to adjoining channels, as did the growing mess on 14,300. The result these days is often one big unholy sewer stretching pretty much from 14,275 on up to 14,325. We've essentially lost 50 kHz of the band to this gawdawful nonsense.

The more I listen to this vocal stench, the more I feel it's time to push the FCC for some changes in our rules. We don't need the FCC to try and sort out who the bad guys are, we just need to have them make it far easier to lift licenses. The police can take your driver's license away on the spot when they catch you screwing up. So why can't the FCC yank a ham ticket?

Right now it's almost as difficult to de-license someone as to get the death penalty. Phooey. If the FCC would tune into our 20m mess and start issuing some license suspensions wholesale, they could clean up our biggest ham garbage pail in short order. It smells so bad around 14,313 that even if they issued license suspensions for anyone caught transmitting anywhere near the channel, it would take most of a year just for the stink to die down.

The small band of idiots who have loused up our band need to be punished. No, I don't think we should hang them. . . perhaps a simple chopping off of their push-to-blather finger would suffice.

If you can come up with a proposed rule making a change which would allow legitimate ham clubs to get the FCC to suspend licenses, I'll help you get it passed. The catch. . . the rule has to some way prevent the bad guys from forming a club and getting the good guys suspended. Or perhaps we should consider adopting the old Vietnam concept: "Kill'em all and let God sort it out."

Curing The Welfare Mess

An editorial in *Newsweek* (Aug. 13, p. 8) recommends the Israeli kibbutz system as a way to revitalize inner-city neighborhoods. Good idea, even if I did propose it several years ago in much greater detail in a *73* editorial during the New Hampshire primary. I even proposed a way to get the project funded by private industry instead of making it still another federal deficit enhancer.

The deficit. The Big D! Politicians have been waving this at us, chanting "doom." I'll bet they have you actually believing the deficit is a terrible problem. You've read it a thousand times, so you ought to believe it, even if it's a giant red herring. Check out *Business Week* (July 30, p. 10) and stop being conned. No economist has found any evidence that the deficit is a significant problem. It's just that it seems like it really ought to be a problem, so we're being manipulated by the politicians and their media prostitutes (as usual).

Israel, faced with tens of thousands of refugees, few with any money or skills, solved the problem by setting up kibbutzim. These were groups, working together to grow food and manufacture simple products. They devised an ingenious system which has worked wonderfully.

The main ingredient I'd add today to help solve our American welfare and inner-city problems would be amateur radio clubs. This is what made the enormous difference for Jordan. As Santayana said, if we can't learn from history. . . etc.

At any rate, thanks *Newsweek*, for the editorial supporting my idea. . . which, far's I know, was original.

Gus Is Gone!

Amateur radio has lost a real pioneer. Gus Browning W4BPD was the ideal ham. . . gutsy, willing to go anywhere in the world. . . an adventurer. He gave thousands of us DXers years of excitement, bringing a new life to amateur radio.

Tens of thousands of hams had the thrill of contacting him in Afghanistan, Bhutan, Mali and many other countries. Hundreds of thousands enjoyed reading his fascinating stories of his adventures. Gus had an enormous impact on our hobby.

In a hobby which has turned sour with bickering in recent years, Gus was always upbeat, invariably bringing his indomitable spirit to his contacts.

Amateur radio is much the poorer for Gus' moving on the the next order of things. Few, if any, people have contributed as much as Gus to this hobby. . . and thus to their fellow man.

Number 36 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 E. Chateau Circle
Payson AZ 85541

The Best and the Worst

October is usually one of the best months of the year for worldwide HF propagation, and it looks like this month will rank among the best in several years for good DX. However, the first half of the month appears excellent while the second half may be somewhat disturbed for propagation.

You can look for mild disturbances on the sun between the 1st and the 5th of the month, which will result in an increased "A" Index. This means an increase of flux density in the Earth's magnetic field and deteriorating propagation—but nothing serious—accompanied by a decline in the 10.7 cm solar flux density.

From the 6th through the 16th, conditions should be excellent for DX propagation. Beginning about the 17th and increasing in seventy to the end of the month, you may expect a very unstable period on the sun, and of course, on the Earth. This two-week span ought to provide solar flares which result in a very disturbed magnetic field on Earth. The Boulder "K" Index and the Boulder "A" Index will be high, and solar flux may be low for this period, resulting in very poor worldwide propagation. On some days during this period conditions will be fair at best. The weekends of the 20th to the 21st and the 27th to the 28th may provide some let up in the generally dismal outlook, with fair conditions prevailing.

The Unpredictable

As always, your best monitor of day-to-day conditions is the WWV broadcast at 18 minutes past each hour when solar-terrestrial conditions are given in detail.

Meanwhile, use the calendar and table for planning your forays into the DX jungle. The daily chart of forecast conditions shows G (Good), F (Fair), and P (Poor) for each day, and *trends* from Good to Poor (G–P) and Fair to Poor (F–P).

Because the sun is extremely unpredictable during a sunspot peak, these forecasts could range from "right on" to "way off." Forecasting is still more of an art than a science, though we have observed that the Earth's atmosphere and geology are affected by solar behavior. Therefore, in periods surrounding a *predicted* poor forecast, observe what's going on with regard to hurricanes, volcanic eruptions, and earthquakes in the world.

See you next month with, we hope, a more positive forecast. 73

EASTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10		20				20	20	–	–	15	
ARGENTINA	15		20	40	40		–	10	–	–		
AUSTRALIA		20	20	20	20	40		20	–			
CANAL ZONE	15					15	15	10	10	10	20	10
ENGLAND	20	40			40	–	–	15	10	15	15	20
HAWAII		15	20	20		–	20	20	–	–	–	
INDIA	20	20				–	–	15	–	–	–	
JAPAN	15		20			–	20	20	–	–	15	
MEXICO	15					15	15	10	10	10	20	10
PHILIPPINES	15		20	20			20		10			15
PUERTO RICO	15					15	15	10	10	10	20	10
SOUTH AFRICA		40	20	20				–	10	10	15	15
U.S.S.R.	40		20	20							20	20
WEST COAST				40	40							20

CENTRAL UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA		15	20	20	20	–	20	20	–	–	–	
ARGENTINA	15	15			20	–	–	10	–	–	10	
AUSTRALIA		15	15		20		40	20	–	–	15	10
CANAL ZONE						–	–			10	10	10
ENGLAND	40		40			–	–	–	15	15	20	20
HAWAII	15	15	15	20	20		40	20	–	10	10	10
INDIA	15			–	–	–	–		15	–	–	–
JAPAN		15	20	20	20	–	20	20	–	–	–	
MEXICO						–				10	10	10
PHILIPPINES			20	20	–			–				
PUERTO RICO							–			10	10	10
SOUTH AFRICA			20	20	–	–	–	–	15	15		20
U.S.S.R.					–	–	–	15	15	15	20	20

WESTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA			15	20	20	20	–	20	20		–	15
ARGENTINA		15	15	20	20	–	–	–			10	10
AUSTRALIA	10		15	15	20	20	20	–	20	–	–	–
CANAL ZONE	10	15				–	–	–	10	10	10	10
ENGLAND	20	20	–	–	–	–	–	–	15	15		20
HAWAII			15				40	–	15	10	–	
INDIA		15	20	–			–	–		15		–
JAPAN			15	20	20	20	–	–	20	–	–	15
MEXICO	10	15				–	–	–	10	10	10	10
PHILIPPINES	10	10					–	20	15			
PUERTO RICO	10	15				–	–	–	10	10	10	10
SOUTH AFRICA	20	20		20			–			10	15	15
U.S.S.R.	20				20		–	20	20	20	20	20
EAST COAST				40	40	–	–					20

OCTOBER

SUN	MON	TUE	WED	THU	FRI	SAT
	1 F	2 F	3 F	4 F–G	5 G	6 G
7 G	8 G	9 G	10 G	11 G	12 G	13 G
14 G	15 G–F	16 F	17 F–P	18 P	19 P	20 P–F
21 F	22 F–P	23 P	24 P	25 P	26 P–F	27 F
28 F–P	29 P	30 P	31 P			

Number 37 on your Feedback card

RANDOM OUTPUT

David Cassidy N1GPH

For the past few months, a ham down in Virginia has been writing and calling the *73* offices. After some rather lame insults directed at Wayne (and some very strange comments lumping John Kennedy, Jimmy Carter, Richard Nixon, Ronald Reagan and George Bush into the same political category), he asks us to reprint a petition that was filed with the FCC, requesting an expansion to the Novice/Tech phone privileges on 10 meters. The following is an excerpt from his letter:

"I own a Radio Shack HTX-100 transceiver, which, at most, puts out 25 watts . . . I am forced to operate at low power with a ⅝ wave vertical antenna. I can afford to purchase a much better transceiver, but I live so close to my neighbors that I must operate QRP. . . . Novice and Technician operators are being totally clobbered out of contacts with other Novices and Technicians by General, Advanced and Extra Class 'amateurs' . . . 73 Magazine, and Wayne Green, overtly and covertly clobber anyone and everyone in amateur radio who don't share their Country Club Republican 'values' . . . i.e., if you don't own $50,000 of 'amateur' equipment, and a $750,000 suburban estate to install it on, you ain't worth talkin' to!"

He goes on to insult Wayne, *73*, and just about everyone who he thinks is to blame for his lousy results on 10 meters (I won't bore you with the rest of it). He is also quite angry that, even though Wayne wrote to him personally with some helpful suggestions, we have yet to respond to him in the pages of *73*. I hope he will consider this an "official published response": Lighten up, pal!

We're talking ham radio here, not brain surgery! Who ever promised you you'd have a clear frequency? If operating on the rest of the 10 meter band is so important to you, upgrade to General Class. Why not strive to do the best with what you have, instead of blaming everyone but yourself for your lack of success? (How anyone could not be successful on 10 meters for the last two years is beyond me. Do you think this guy might have his antenna plugged into his microphone jack?) If you put as much effort into studying for your General ticket as you do into writing long-winded letters, you'd be on 20 meters with the rest of the weirdos by now (my apologies to all the nice people who operate on 20 meters—the weirdos know who they are).

Now that I've got that out of my system (or at least suppressed for the time being), let's take a look at the one point that this gentlemen raises that deserves some serious thought. Can a Novice/Tech get on the air, make contacts and have fun, without an antenna farm the size of Southforks Ranch and a cash outlay for equipment the size of Fort Knox? The answer . yes. How do I know? I've been doing it for years.

The Low Budget Ham

My first amateur radio station was a borrowed Heath HW-16 and a 15 meter dipole strung outside my bedroom window. Total cost to my 13-year-old pocket . . . about two bucks for the wire (somebody gave me the 12 feet of coax I used as a lead-in.) Did I work the world? No. Did I have a blast working Texas? Yes!

For the past two years I have been operating almost exclusively in the Novice/Tech portion of 10 meters (that's where most of the action has been). I have over one hundred DX countries (some of them worked, with much patience, in the middle of pile-ups). My "super-expensive-deluxe" rig? A Heath HW-101 that my Dad built about 15 years ago. Total output on 10 meters? About 50 watts. My "spacious antenna array"? A full-wave loop, cut for 10 meters, fed with 400 ohm ladder line through a used MFJ tuner, wrapped around the inside of my bedroom window in the middle of Hamden, Connecticut. (One of the fringe benefits of moving to New Hampshire to work for Wayne is that I am finally able to put up some outside antennas.)

Let's look at the total cash outlay to duplicate this station:

Used HW-101—$150 (I've seen dozens of them for this price)
Used antenna tuner—$40 (or build or buy a new one for not much more)
Used SWR Meter—$30
Used Microphone—$40
Wire Antenna—$5 (this is high, but let's not pick nits)
Ladder Line—$20 (this should give you enough for 4 antennas)
Total Cost: $285

Any hardworking 10-year-old with a paper route can save $285 in a couple of months. I used this station for over two years, operating from a one-bedroom apartment. No, I wasn't the loudest signal on the band, but every 5-8 report was a personal triumph. I got a great deal of satisfaction telling stations all over the world what my set up was. Most of them took a few seconds out from working the pile-ups to congratulate me on doing so well with so little. Not once did I feel like I needed a more elaborate station. Instead of complaining about my antiquated gear, indoor antenna, noisy power lines and lack of any real ground system, I just decided to work around the obstacles and have some fun. I learned a lot in those two years. I made some good friends, too. I learned something about radio and electronics from each one of them. I was having a ball!

Isn't that what amateur radio is all about?

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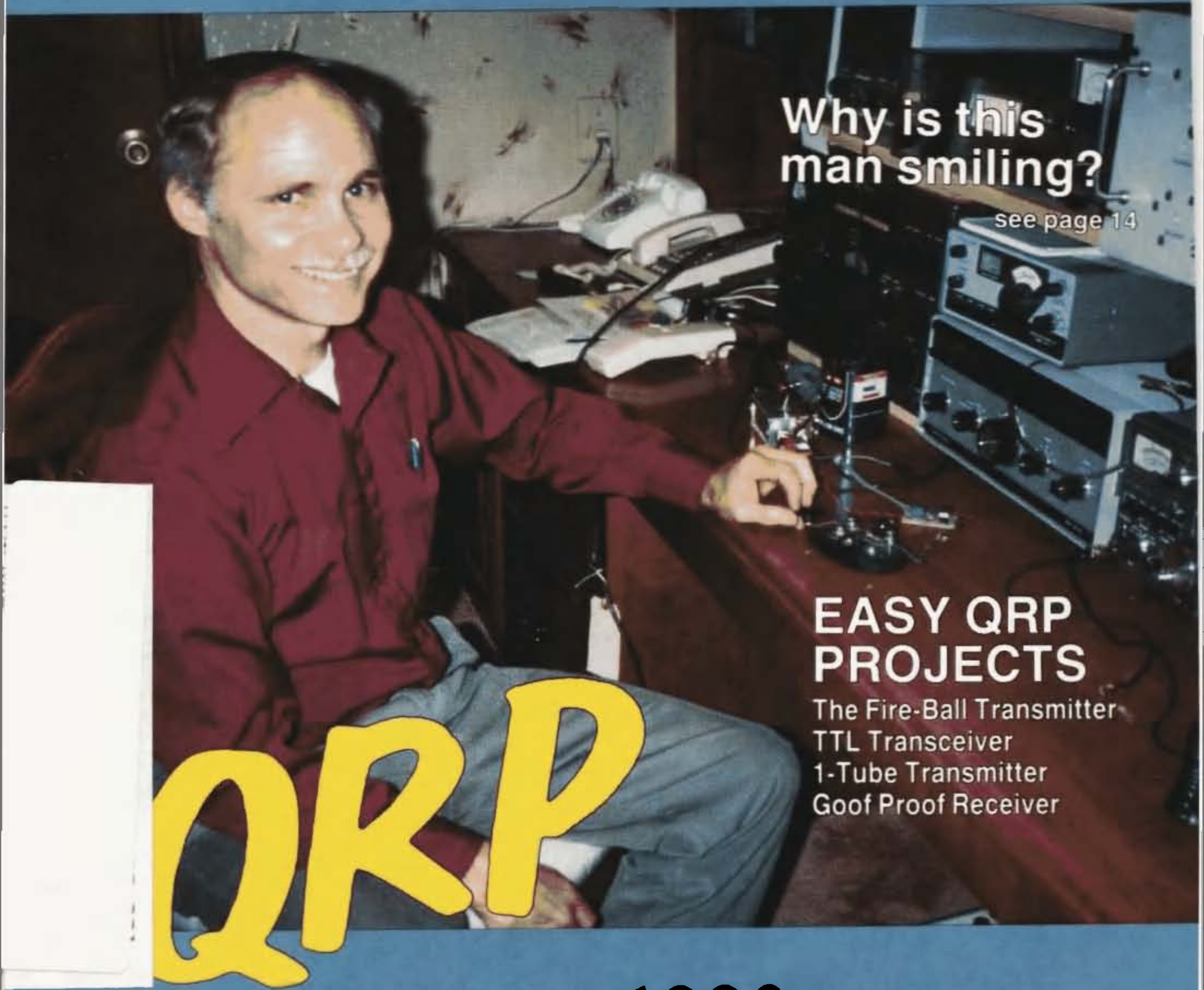

1990 Holiday Gift Guide

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Number 1 on your Feedback card

LETTERS

From the Hamshack

Ivy Renga W8IUO, Milford MI I have enjoyed your *73 Magazine* for over 18 years, and have watched it progress from FM to RTTY (computerized) to packet and now ATV on balloons. You have always dared to challenge the amateur radio community, and of course, the ARRL. This is good! Many of us tend to get stuck in a groove and need a little "kick in the pants" to realize our full potential.

Ben Johnson NY0O I'm a 37-year-old pharmacist and have been a ham for 22 years. In regard to your August editorial I'd like to see spread spectrum articles. And I might be interested in running for ARRL director. I joined the League in March 1967. Would I be eligible for the next election? How much time would it involve? I work for K-Mart and getting away for meetings might be a problem. Would I have to buy my own plane tickets to Newington? Is this strictly a job for an old man?

Not this year, Ben. You must have at least four years of continuous membership to qualify. Yes, of course, they pay your travel expenses, and generously, too. Time? That's more a reflection of your interest. You should get around to as many clubs as you can and find out what your constituents are thinking. If I were going to be a director I'd get set up with a Mac and put out a monthly newsletter to help provide a communications medium between me and the clubs in my division. With this I could give them information on what is going on and generate interest in solving some of our more serious problems.

. . . Wayne

Mark Lovejoy KB8KJZ I've been reading *73* for some time now and like it a lot. Your editorials are an inspiration and a stimulant when needed. Keep up the good work. In case anyone doubts your advice on getting publicity, I can say that the media is looking for stories about ham radio. I wrote an article about what hams do, different activities and modes, and the where/when of the club meetings. The paper thought it was great. The club info went on the front page that day and now they want to run more ham news. I'm hoping to get the club members to contribute material on RTTY, contests, QRP, and so on.

John KB7DNF You have a good magazine. I think you should publish the calls of lids, jammers, and the hams creating the mess on our bands. We need a clearing house for offenders.

John Thurmond KB5HWS, Little Rock AR I am 14 years old and I got my license one and a half years ago. Since then I've been trying to form ham clubs in the various schools I've attended. But this proposed Communicator license will take away my hope of recruiting new hams. Anyone can get a Novice license, but the Communicator will be much more difficult. Can you imagine me trying to explain to the average high school student what effect the F-layer has on radio propagation? The people who wanted a no-code license wanted one with HF privileges, not just UHF, so let's drop the whole thing.

Why does ARRL's sneaky strategy to rekill no-code remind me of Oliver and Hardy? "Stan, a fine mess you've gotten us into this time!" . . . Wayne

O. Sprang WB0??? Re your June editorial comment on the huge postal rate hike and the "stupifying mail monopoly"—right on! I've been a postal worker for nearly four years, and I see the situation as hopeless. Thanks to your advice (get off your butt and out of your rut), I am changing. I am studying for my license with the help of the local club. I hope to help the local school set up a club. I have enrolled in a communications course and plan to get involved in electronics again. I quit electronics school in 1978—what a mistake! I would rather spend 50 years in a challenging career than work as a postal zombie for 25 and retire early. Keep it up, Wayne, you are getting people interested in ham radio and electronics! Your comments do not fall on deaf ears.

Let me know your call, when you get it. Keep in touch! . . . Wayne

C. Hacksworth ET2/c USN You couldn't be more right about the need for youngsters in amateur radio. Recently, while home after two years at sea, I went to a local ham club meeting with my grandfather. I was the only person under 30! Most were retired. When no-code was brought up, you'd think someone had cursed their mothers. These old-timers feel that no-code is a threat to them. What's so great about the code? Oh, tell W9KK that we Electronic Technicians (ETs) are not in any way, shape, or form, board swappers. We have to troubleshoot down to a component every day. How many procode fogies can handle that? This letter is a plea to take down the old barriers and let us young people in. My grandfather is actively trying to license youngsters. I wish more old-timers were like him.

Dennis Murphy KB8LZW While you seem pretty much well-informed and balanced in your opinion in your editorials, I feel you are mistaken about Techs. I don't believe that the majority of Techs are semi-hams in the process of stagnation. The majority are Techs because they are interested in the VHFs and UHFs and have no reason to upgrade.

Thanks, Dennis, for enlightening me. Golly, I was afraid, after talking with a few hundred of them on repeaters, that there were 105,000 Techs, all so terrified of the code they're willing to miss talking to hams all around the world. But how come, if they're so into VHF, they don't write about all the experimenting they're doing up there?

. . . Wayne

Gib W7GTE I find no argument with your diagnosis of the ARRL. Some of the crew there are well qualified, but many of them are NOT going to say anything contrary because that means goodbye job. Not too smart. Others at HQ . . . well. I was a vice-director for two years.

John B. Bradley WJ0D, DA1JV Keep up the good work, we all need prodding from time to time. You hit the nail on the head more than most would like to admit. Here is another one for your magic bag of "get it done" tricks!

I sent two letters to *CQ* and the ARRL to enlist their aid with whoever they have in the know to help reverse the abandomem of the Military Amateur Radio System.

This is not just hot air, since Paul Ramey, USAREUR MARS director told me this was happening, not only in the Army, but the Air Force as well. He had TWX copies of USAF messages stating that this was to happen in USAFE as well as describing what he was doing to phase down USAREUR's participation in Europe. There is not a replacement for him. Since the Army and Air Force are ending support for MARS, the rest is up to individuals.

MARS was a great help to me when I was away from the family, whether in the USN or USAF. MARS and local OA hams got California quake info to those stationed here in Europe; and probably for those in Asia as well, letting family members know that relatives in California were OK.

Hmmm, MARS is being scuttled, eh? So what's the down side for amateur radio?

MARS has kinda kept to itself, with little effort at maintaining visibility. You either grow or you die.

I doubt that the military brass have any concept of the value of MARS. I know I don't, and I'm in the middle of things. . . . Wayne

Ken Stone WA2VWS, Cherryvale KS In the June issue of *73* there was a very good article by Frank Brumbaugh on building a simple gaussmeter. I'd wanted such a meter for some time, and the article stimulated me to go ahead and build one. Mine is patterned after Frank's, but in my opinion much improved. Much of this was a result of Wayne Green asking his readers to do such a project. But there is a fly in the ointment.

Frank included a method for calibrating the gaussmeter. From correspondence with him, I learned he got the technical information from a consultant, and what he got and wrote up has a serious technical error. The article says the field intensity in gausses at the canter of a long solenoid is NI/M (ampere turns per meter). This is incorrect by a factor of nearly 80. The correct equation is gausses = 0.004πNI/M (or 0.01257NI/M). Still another form is ampere turns per meter divided by 79.58.

I have written to *73* three times already and the response has been exactly zero. For a technical magazine, this is unacceptable. To rub salt in the wound, the magazine published a trivial letter from a ham objecting to the use of cgs terms in the article instead of mks terms!! I have seen damning letters published before and I have seen corrections published. What is so holy about this error that I get nowhere trying to get a correction published?

Thank you for your persistence! In this letter you have caught the fly in the ointment. The other letters were far too long and involved for "Letters" and we weren't sure which point you considered most important.

. . . de Linda KA1UKM

Bill Hollister, Jr., KA9ZHM, Big Rock IL *A note to Gordon West WB6NOA, author of the "Service Survey" series, forwarded to 73:* [Regarding] your article on Alinco service: I had the opportunity to learn firsthand that Alinco's service and warranty are even better—yes, better—than the written word. We (Alinco and I) had a problem that spanned almost three years, but at no time were they anything but cooperative and polite. Too bad they make so few radios. How about 440 or HF?!

W.M. Ashwood, Jr., WD5KBY/MM2 On many voyages between Corpus Christi, Puerto Rico, and Bayonne, I've heard no less than 50 bootleg stations on 10m. They were all fishing boats engaged in the shrimp industry and boat captains talking to their XYLs.

As they seem to prefer AM and FM, and shrimpers are notoriously long-winded, they should prove to be an interesting foxhunt for coastal clubs.

However, I don't recommend personal confrontation. With detailed information, the FCC can deal swiftly with the situation.

Chris Kochenour WD1W, Pownal VT Here is an idea, offered as a challenge to every licensed ham, that will swell our ranks for now and forever.

Here is the challenge: Every year, each and every ham take one person under his/her wing, and teach/guide them to the point of being licensed. Imagine 500,000 hams in 1990; 1,000,000 hams in 1991; 2,000,000 in 1992 . . . 8,000,000 in 1994.

What are you waiting for? Get off your duff and take the challenge. Enlist someone now . . . Oh—too many kids and overcrowded bands? Well, your only hope is that you die before amateur radio does.

Page Pyne WA3EOP, Williamsport MD Wayne's recent editorial on the future of our hobby should give everyone something to think about.

I read recently in the *Philatelic Press* about COPO, a nonprofit organization composed of more than 450 stamp clubs, dealers, and other groups and individuals, for the purpose of promoting stamp collecting. COPO offers The Lidman Prize for the best article about stamps or stamp collecting appearing in the nonphilatalic press. The Council of Philatelic Organizations awards the winner $500, an engraved plaque, and an expense paid trip to the award site.

With the need for good public relations, amateur radio should have its own version of a Lidman Prize saluting the best writings about amateur radio in the nonamateur press. Perhaps we could have several categories annually, for newspapers, periodicals, videos, etc. Do you think we could find a national organization to grab the ball and run with it for the good of amateur radio?■

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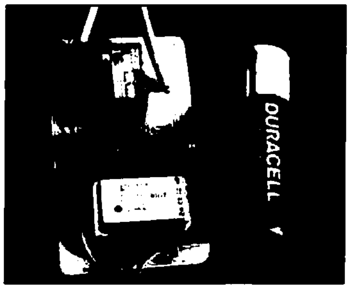

Build the FIRE-BALL... *see p. 18.*

Cover by Ruth Benedict.

DEPARTMENTS

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Contract: You are hereby obligated to visit your local ham store and enter the *73 Amateur Radio Today* HAM IT UP! Sweepstakes. Is your local ham store one of the few misguided souls who hasn't provided you, his customer, with this opportunity to win thousands of dollars worth of ham gear? If so, you are hereby deputized by Uncle Wayne himself to do anything within your power to show said retailer the error of his ways, and to get him signed up.

Number 2 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1

On Being Reasonable

On my letterhead I have a quote from George Bernard Shaw: "The reasonable man adapts himself to the world, the unreasonable one persists in trying to adapt the world to himself. Therefore, all progress depends on the unreasonable man."

Are you a reasonable man? Most men are. They peacefully go along with the laws and customs, whether they agree with them or not. They try not to make waves. I've always been unreasonable. Worse, I've always tried to encourage other men to be unreasonable.

Our New Hampshire constitution is clear on this matter. It says that if a man believes a law is unreasonable, it is his responsibility to oppose that law.

There are some aspects of our society that I feel are unreasonable for me to accept. Like our present educational system. Like our consumer electronics industry loss. Like the erosion of amateur radio . . . in both quality and quantity.

I get hundreds of letters from readers who say they're fed up with amateur radio. Some are discouraged by the lack of interesting contacts. Some by jamming, bad language or ham club elitism. The reasonable man, faced with such obviously insurmountable obstacles, gives up. The unreasonable man says, "Hey, what am I going to do about this mess?"

Is it your destiny to be a sheep . . . or a shepherd? Are you a reasonable man who accepts what others deal out, no matter how unpleasant? What kind of legacy will you leave? Will the world miss you much when you pass on?

We've had a few hams who've done a great deal to make hamming more fun for the rest of us. I've been privileged to know a number of these outstandingly unreasonable men. There was John Williams W2BFD, who did more than any other ham to popularize RTTY. There was Bill Hoisington K1CLL, whose simple construction articles in *73* got a generation of readers into building. There was Gus Browning W4BPD, whose DXpeditions made hamming more fun for thousands of us.

You don't have to write on a big slate to contribute. Look at Bill Welch W6DDB, who's helped thousands of Novices get licensed! And Gordon West WB6NOA, whose Radio School has also helped thousands get licensed. How about Bill Pasternak WA6ITF and his *Westlink Report*? We've had lots of hams who have helped our hobby. Then we've a couple hundred thousand reasonable men who have left no mark to show they were ever with us except one line in the *Callbook* . . . and then, eventually, that final line in Silent Keys.

Reasonable men do not win contests, go on DXpeditions, write construction articles, set up repeaters, get deeply involved with emergency operations, have interesting QSL cards, have the time or interest to elmer new hams, are an excruciating bore to contact, tend to absolutely hate my editorials, have never experimented on any microwave bands, have never even actually do something about it, you are a cypher. And being on the school board sure won't hurt.

Is your local ham club generating Novices? Is it putting on fox hunts? Organizing a big Field Day outing? Getting together for VHF contests? Has it a repeater? Are the meetings interesting enough so the club is growing? When you get your Silent Key listing, what will you have left behind besides a few minutes of empty band space where you used to ragchew?

Sure, I'm unreasonable. And I've done just about everything I listed above. But, you know, I haven't done anything you couldn't have. It's not that I'm a superman, I'm just plain unreasonable. When something stinks I don't hold my nose and turn away . . .

"We've had a few hams who've done a great deal to make hamming more fun for the rest of us."

considered OSCAR or moonbounce, have never made RTTY, packet, SSTV or ATV contacts, never made DXCC, never made BPL (may not even know what it is), never been a ham club president or organized a hamfest, never flown a plane or been up in a balloon, probably never skied or dived, and so on. The reasonable man not only doesn't contribute to progress, he generally resists it, but not vigorously . . . as that would call for an actual commitment.

The American educational system is a mess. You know that. You've probably been grumbling about it. Have you done anything? Have you read much about it to find out what's gone wrong? Have you been taping the excellent TV documentaries on the subject? Now, more important, once you understand the problems and some proven solutions, are you volunteering for your local school board to help make some changes?

You may believe that ham clubs in your local schools would help youngsters develop an interest in science and high-tech careers, but unless you I get out the mop and see what I can do to clean up the mess.

When someone has a rotten signal I do my best to politely let 'em know. When someone is lousing up the band with bad language or jamming, I speak up, doing my best to keep my cool . . . which isn't easy at times. And when I come across outstanding problems such as KV4FZ and K1MAN present, I write, hoping you'll take some initiative.

The reasonable man would never consider running for ARRL director. The reasonable man has adapted to the way things are, either by putting up with them or turning away and ignoring 'em.

If you read, perhaps you've read *Hit Men*, the story of how The Mob has taken over control of the music business. If I can find some unreasonable people to help me, I've got a sneaky plan to elbow The Mob back out again. I'm already about 10% along with this guerrilla action, so I'm doing something.

How about helping to keep our country in better touch with the latest in high tech developments, most of which are happening in Japan . . . and which, oddly enough, the Japanese resist sharing? I came up with a beaut of a solution to this one . . . and planted the seed in exactly the right place for optimum growth. I know that reasonable readers are tired of me blowing my horn about all the things I've done. But I find that unless I can prove that it's actually possible for someone to do things, reasonable men convince themselves that it's beyond them.

When I explain how easy it is to make money I get jealousy and hate from reasonable men . . . and hey, how can I get a piece of the action, from unreasonable men. When I suggest that all it will take is a few unreasonable hams to run for ARRL directors and bring the League into the '90s, I get a mixture of apathy and hate. The reasonable man says I'm trying to change things and that's bad. The unreasonable man says, "Hmmm, who do I know who would make a good director and help get us out of the mess we're in?"

So yes, while reasonable men were rag-chewing on 75m, I was out there on an icy New Hampshire mountain top, making contacts with seven states on 10 GHz. And while the reasonable hams were fighting pileups to get through to me, I was operating from JY, 5Z4, 5W4, 7P8, 3W6, FP8, FO8, FK8, 9N, 9M6, 9M8, etc. And Gus was operating from Western Africa. And Lloyd and Iris Colvin from everywhere else in the world.

What were reasonable hams doing when I was building RTTY, NBFM, and SSB equipment . . . and experimenting with SSTV, moonbounce, aurora, 10 GHz? What were they doing while I was winning Sweepstakes, DX and VHF contests? Sure, I've worked about 350 countries and rag-chewed with tens of thousands of reasonable hams. But is the reasonable man irritated with me blowing my horn about all that, or because he's had the same opportunities I had and he has never done anything?

I'm writing this because the world needs more unreasonable men. Can reasonable men be blasted out of the herd with logic? It's not safe being unreasonable, so perhaps not. You have to think. You have to read and learn. You have to take chances! And you have to face the multitudes of reasonable men who will resist you every inch of the way.

WARC-'92

I got a letter from the League listing a whole bunch of ways amateur radio looks like it could get badly hurt at the coming WARC. This was accompanied with a request for a donation. You can imagine what a tough time I had not reaching for my check book!

Of course, having participated as an official WARC delegate in Geneva, I knew that by conference time the delegates from the other countries would have their positions cast in concrete, giving them very little room to maneuver. The time for WARC work is right now, not two years from now, after it's

Continued on page 73

QRX . . .

EDITED BY LINDA RENEAU KA1UKM

BARF Members Cited

Several BARF members have been cited for violating Section 97.101(d) of the FCC rules—causing willful and malicious interference to the communications of amateurs. The names of all members receiving "Notices of Violations" and "Notices of Apparent Liability" from the FCC are unknown at present. Herbert L. Schoenbohm KV4FZ is the person most amateurs name as the cause of the mounting 20 meter controversy.

Two decades ago Schoenbohm was a hero among radio amateurs for his public stand against abuses by wealthy yachtsmen who openly used the 15, 20, and 40 meter bands for business phone patching. Due to his efforts, within a year virtually all the violators were off the air.

Unfortunately, he later expanded his campaign, forming the Better Amateur Radio Federation (BARF) as a net to counter the activities of nearly all established service nets and international phone patching.

Other BARF members who have been fined include Richard K. Eastman N5FX and William Terrill K2BFI ($1,000 each). Cited, but not fined, were Harold D. Case WD4PZT and William Pike NØDCP. Last September, the FCC began preparing an in-depth "Public Notice" on the matter. From the *Westlink Report*, Number 584.

Hams in Action

Last August, Tomah, Wisconsin, was hit by severe thunderstorms and flooded by more than eight inches of rain in less than three hours. The coordinator of the Monroe County Emergency Government in Tomah contacted Mark Loether KB9EBX to request the assistance of the Tomah Regional Repeater Group. The Monroe County ARES went promptly into action, helping with evacuation and establishing radio communication.

As more people were evacuated from their homes on the morning of the 18th, Richard Koebernick KA9ZZK and Jason Sweeney N9GNA established intitial communications between the Tomah Red Cross at evacuation centers and the LaCrosse Red Cross office. Later, Mike Warnock WN9P arrived from Sparta to relieve them when their own homes became endangered.

Bill Bastain N9BOE manned the local Tomah Weather Radar as more rain threatened the community. Dave Arnold NØCUO from Necedah arrived that afternoon to provide additional support and relief, and that evening Clide Downing N9KAK from the Wisconsin Rapids/Wood County Amateur Radio Service came with fourteen more amateur radio operators.

On Sunday, local operators Allen Bell KA9PSL and Ken Teclaw N9GXP stayed on duty and maintained communications between the emergency government and the Red Cross. From the *Tomah Regional Repeater Group.*

Calling the USSR

Net Manager Glen Baxter K1MAN of the International Amateur Radio Network acknowledged on the air August 22 that he received a Notice of Rules Violation from the FCC for running a phone patch to the Soviet Union, a nation with whom the United States has no third party agreement. According to Baxter, his organization was trying to promote international good will by helping a Soviet exchange student make contact with home, and the operator in the USSR thought it was legal on his end.

Baxter says that he notified the FCC monitoring station that until a third party agreement is in force between the two countries, he will refrain from such activity. The FCC station apparently accepted his explanation; Baxter says he received a FAX from them and it appears that the matter is closed. The FCC in Washington, however, has the right to review the decision and the option to take punitive action. From the *Westlink Report*, Number 584.

SAREX Packet Hints

Be sure to use the right callsign when you try to connect to SAREX. Tom Clark W3IWI reports that both the HK21 ROBOT TNC and the software for the GRID laptop computer have the calls defaulted to WA4SIR (SSID=Ø), not WA4SIR-1. The call WA4SIR, belonging to astronomer Ron Parise, should be used unless for some unanticipated reason, the defaults are overridden. Tom says the best advice is for you to monitor the downlink signals from STS-35 and use the call you see on the downlink. The ROBOT TNC code uses only one SSID at a time.

The SAREX handheld cannot receive when it's transmitting. Do not run full duplex on the ground! Leave your TNC in half-duplex mode with CD active, just as you would for normal VHF packet operations.

Be careful with your TNC's timers, DWAIT (How soon do I transmit?) and FRACK (Then how long do I wait?). Try to pick a DWAIT nobody else is using, and set FRACK for at least three seconds so that you won't transmit when the ROBOT's FUDtimer (listening before transmitting) decides it's time to transmit. From *W3IWI via AMSAT News Service,* and *Westlink Report.*

Operation "Desert Shield"

Do you want to listen in on the Middle East?

Try these times and frequencies (kHz):

0200–0300Z	Radio Cairo	9475, 9675
0300–0350Z	Radio Baghdad	11830
0300–0400Z	Voice of Turkey, Ankara	9445, 17860
0300–0400Z	United Arab Emirates	13675, 15400, 15435
0300–0415Z	Kol Israel	9435, 11605, 12077, 15640
2000–2200Z	Radio Baghdad	13660

"Tokyo Rose" broadcast to our troops are on 11860 at 1000–1200Z, 1600–1800Z, and 2000–2200Z, but propagation may not be good. (DX packetcluster message by K5KJ and W5USM; courtesy AD5I.)

U.S. Airbase in Insulic, Turkey: 6.738, 11.176, 13.214 (courtesy AJ9S).

British Forces Broadcasting Service to Saudi Arabia: 7125, 9640, 13745, 15205, 17695, 21735 (courtesy K5KQG).

From *The Parking Ticket*, #2322.

Microwave Conference

On January 30, 1991, the Colorado Front Range Microwave Society is sponsoring the Microwave Update Conference at Denver. By providing an informal forum for exchanging ideas, designs, and operational experience at frequencies above 900 MHz, the conference intends to serve the needs of the amateur microwave community.

All radio amateurs are invited to submit talks and papers. Presentations may range from 15 to 45 minutes long. They should stress practical applications on all aspects of microwave operation.

A collection of presentations will be published. Final versions of the material should be ready by November 15, 1990. If interested, contact Don Lund WAØIQN at P.O. Box 1664, Boulder CO 80306. *[We regret that we were unable to put this notice in the October issue, but some of you will surely be interested in attending the conference, and others may have a finished manuscript on hand ready for submission.]*

TNX...

...to all our contributors. You can reach us by phone at (603) 525-4201 or by mail at *73 Magazine,* Forest Rd., Hancock NH 03449; and by e-mail on CompuServe ppn 70310,775, MCI Mail "WGEPUB" and the *73* BBS at (603) 525-4438 (300–2400 bps), 8 data bits, no parity, one stop bit.

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73 Review *by David Cassidy N1GPH*

MAX System Ground Plane Antennas

A quality, low-cost alternative to the ol' "coat hanger special."

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Gloucester MA 01930
(508) 281-8892
Price Class: $30

Is there a Technician class or higher amateur who has not built a 2 meter quarter-wave ground-plane antenna? If you haven't built one, here's the formula: First, cut a couple of wire coat hangers into five pieces, each 19 inches long. Scrape the coating down to the bare metal, then solder one piece to the center of an SO-239 for the radiating element. Solder the remaining four pieces to the corners of the SO-239 at a 45 degree angle. Trim for lowest SWR and you're all set! I've been using this exact version, held to the roof with four roofing tacks, for local repeaters and 2 meter packet.

The MAX System

A company called Cellular Security Group has taken this antenna (which they admit comes directly from *The ARRL Handbook*) and named it the "MAX System." These antennas are available as the MAX 146 for 2 meters, the Max 220 for 220 MHz, and the diminutive MAX 440 for 440 MHz. For only $29.95, including free shipping and a money-back guarantee, this may be the year's best bargain in ham radio!

The antenna comes fully assembled, all in one piece. It looks like any other quarter-wave ground-plane except for one important difference: the quality of construction is outstanding. The elements are stainless steel, the soldering is first rate, and it's all protected from the weather by a PVC endcap. A six-inch extension tube comes standard, and a 38-inch tube is available for $5. You can also order your antenna with an N-connector (recommended for 440). Run some coax up the tube, connect, fit the antenna onto the tube and mount it any way you like: on the side of a tower, at the peak of your roof, hanging off of a convenient pine tree, etc. I've got the thirty-eight inch extension taped securely to a 10-foot Fiberglas™ pole, which is in turn pushed into the ground. A semi-permanent installation at best (with the extra three feet the antenna is about 12 feet above ground level), but it works great and that's what counts.

How well does the MAX 146 work? It's not going to give you the gain of a beam, and refreshingly, the company doesn't claim any extraordinary and unbelievable performance. The SWR is below 1.4:1 across the entire 2 meter band.

In a direct comparison test between my homemade "Coat Hanger Special" and the MAX 146, the Max 146 wins hands down. Even though my home-brew quarter-wave is on top of the roof (35–40 feet) and the Max 146 is only 12 feet above the ground, the Max 146 gets me connected to packet nodes that my home-brew antenna can't. A repeater about 40 miles away gives an S7 reading on my home-brew antenna. When the same radio is connected to the Max 146, I get a full meter reading. This simple comparison may say more about my construction abilities than I'd like to admit, but the point is made. The Max 146 is a quality antenna that does exactly what it is supposed to do: give the best performance possible in a low-cost antenna.

The Max 440 has the same quality construction, plus the added benefit of its small size. You can attach it directly to your HT! It would take some contortions to make it comfortable to wear on your belt, but the performance benefit over a rubber duckie makes it worth the inconvenience of carrying your radio. You could always run some coax from your HT and mount the Max 440 on your hat. That should get you noticed at the next hamfest!

The only problem I have with the Max System antennas is more of a suggestion than a "problem." When first looking at the antennas, my initial thought was that they would make great camping/backpacking antennas. Then I realized that the elements are permanently soldered to the connector. I think that Cellular Securities Group would have a whole new market for these little beauties if they somehow made the ground-plane elements removable. Perhaps a banana jack/plug arrangement would work. They could even offer a separate portable model. If the quality were the same as the current models, I know they'd have a winner. 73

David Cassidy N1GPH is the associate publisher of 73 Amateur Radio Today. *Contact him c/o* 73.

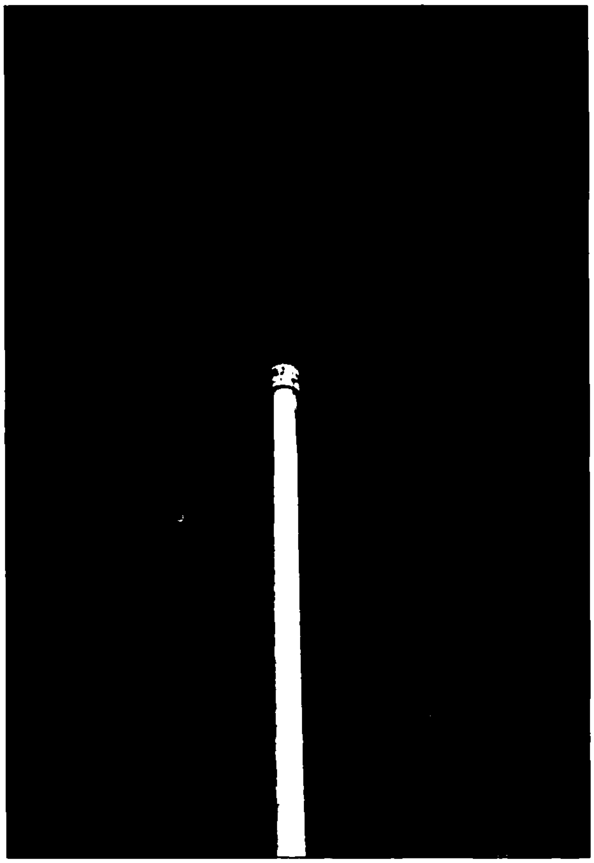


Photo A. Cellular Security Group's MAX-146.

The Roll-Up 10–20 Antenna

Just right for portable QRP.

by Jay M. Jeffery WV8R

The biggest problem I had to face when I decided to assemble a self-contained, portable station was the choice of an antenna. Since the station was QRP, I knew that the antenna must be as efficient as possible, yet relatively compact. Experiments with shortened antennas requiring loading coils, antennas made of coiled wire, and small loop antennas, were not encouraging. The only thing I hadn't tried was a full-size wire antenna.

Full-size wire antennas get quite large for wavelengths greater than 20 meters. Sticking to bands in the 10 through 20 meter range, I could use an antenna about 16 feet long per leg which could be easily hung on convenient projections and completely rolled up for easy carrying.

Designing the Antenna

Of course, the length for a quarter-wave on 20 meters CW should be about 16'8". But what about the other quarter-wave needed to form the second leg of the dipole, or to act as a counterpoise?

Other problems: How could the antenna length be varied so that the VSWR can be controlled without a tuner? How could the length be varied to accommodate other bands?

Not wanting to carry around all sorts of wires cut for different requirements, I hit on the idea of terminating the wire with a coil of additional wire wound on my hand. (Using the hand as a coil form has many advantages, especially when you have to wind and unwind the coil in the field.)

Since the wire is handled often, and since it will be near the operator and other people, it must be insulated and flexible enough for easy coiling. A good quality zip cord (like a lamp cord) meets these specifications.

The antenna I built worked very well indeed. The coil behaved like a slight top loading, and effectively terminated the length of wire. By rolling and unrolling the coil, I could precisely change the effective length. As an added benefit, the top loading somewhat shortened the length of the antenna, but not enough to affect efficiency.

The final form of the antenna consists of two legs terminated by rolls of the same insulated wire. The rolls should be formed so that the legs are slightly longer than the length normally required for 20 meter operation. Once you determine this coil size by trial and error, you can tape the roll more or less permanently. New turns may be added or taken away to change the frequency or to adjust the VSWR.

You can determine the band locations by experiment and mark them with a piece of tape so you can easily locate them in the future.

Setting Up for Operation

The simplest way to use the roll-up antenna is to hang one leg up—the leg connected to the center conductor—on the top of a door, or any handy projection, and snake the other leg—braid side—around on the floor or the ground. Then adjust the rolls and hold them in place with a wire rubbish bag tie along with a piece of #14 insulated house wire. House wire is handy because it can also serve as a hook to hold up the antenna. In this form, it is a sloper (see Figure 1). If you can get it high enough, it becomes a vertical.

You can also use the roll-up as a standard dipole or in a horizontal vee configuration for a little gain.

Since I operate QRP, I only use about 6" of coax between the transmitter and the legs of the antenna. If I plan to use more power, I extend the length of the coax so that the antenna is as far from me as possible, reducing the exposure to radiation. Also, with more power and longer coax, it's easier to use a tuner than to try to find the new resonant positions.

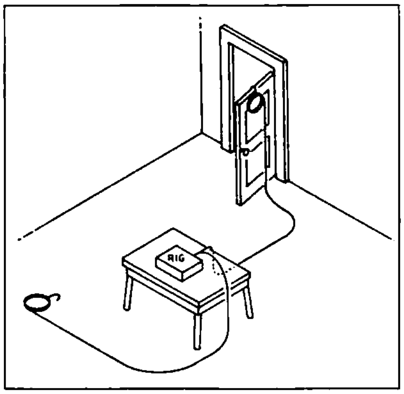


Figure 1. Set-up using the door as a convenient projection.

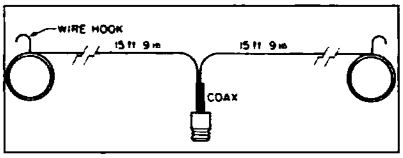


Figure 2. Using the hand as a coil form has many advantages, especially in the field.

(Incidentally, the roll-up was intended for QRP rather than high power, so take care if you're going to use a "hot" antenna near people. Even with insulated wire, there's a danger.)

The antenna doesn't work well in steel frame buildings, houses with aluminum siding, and so forth. If you have shielding in the construction, you have to get the antenna outside.

For 20 meters, the length of each leg is about 15'9". The 15 meter mark is at 9'9" and the 10 meter mark at 6'8". The estimates for 17 and 12 meters are 10'11" and 8'11", respectively. However, these should be determined experimentally.

With a tuner and a little more power, the roll-up will work on 30 and 40 meters.

Each leg should be made from 32 feet or more of one of the two wires that make up a zip cord. I used 32 feet of insulated wire, split apart carefully in order to avoid bare spots. Tape should, of course, be applied to any bare spots that appear, and the ends should be insulated. I made the legs of the dipole 15'9" each, up to the point where the rolls were to begin. The excess wire was then hand-wound to form the rolls. The legs were connected to the coax, which was terminated in an appropriate plug, in this case a PL-259. Figure 2 shows the outspread, complete antenna in dipole form.

If your transmitter doesn't have a built-in SWR meter, you'll have to connect it to an external meter. Otherwise, you'll have to find some other means of determining what's happening, such as using a field-strength meter.

Performance

The roll-up works well on SSB or CW QRP, but sometimes I have to spend a little time adjusting it for the conditions. Often, by bunching up the counterpoise or spreading it out better, I can compensate for using a different rig or setting.

My favorite place for using this antenna is the front porch, in summer. There is a flower hook in just the right spot in the ceiling for hanging the antenna. Every once in a while something works out without planning, like that hook.

Building this antenna is a simple project, and if you're a QRP buff, a very useful one. Even QRO types can get some fun out of it.

Jay Jeffery WV8R, 3819 Parkdale Rd., Cleveland Hts. OH 44121

Working the World with 2 Milliwatts

The ultimate QRP challenge.

by John Devon KI6DQ

What enables a puny 2 milliwatt signal, representing a power 300 times smaller than a flashlight, to carry intelligence halfway around the world? Bob Moody K7IRK of Palestine, Texas, may have a clue. He and his tiny "Fire-Ball" transmitter at 2 milliwatts have worked countries as far away as Argentina, Switzerland, and Russia, as well as all fifty American states.

When asked why he did it, all he said was, "It takes a warped individual to try a project like this." Moody and Bill Smith WA6YPE, who together sell the Fire-Ball, have formed a user's fraternity to encourage and enable others to accomplish Moody's feat.

Worked All States

It took one year, 27 days, one hour, and 15 minutes, but on April 19, 1990, Moody worked Nebraska, his last state for WAS (Worked All States). Moody says, "Phil KB0FNH was patient enough to dredge through the 40 meter QRM (interference) and copy the 2 mW signal." He just received his last QSL, Michigan, in early July, allowing him to apply for WAS. Some QSLs proved difficult; he told one man he would crawl to his doorstep with BC-610s (WWII vintage heavy metal) strapped on his back to get a QSL. Is that desperate?

QRPppp..

Perhaps his most dramatic achievement was a certificate from the QRP Amateur Radio Club, International (QRP ARCI) for over 218 million miles per watt between Glendora, California, and Palestine, Texas, using less than *6 microwatts!* *[On 9/9/90 I made a two-way Fire-Ball QSO with Bob K7IRK from the W2NSD/1 club station here at 73. I actually heard his 10 microwatt signal just before the band folded for a 150 million miles per watt contact!—WB8ELK/1]*

Photo A. Bob Moody K7IRK operating his Fire-Ball rig.

What remarkable equipment did Moody use? His original transmitter was a keyed computer clock oscillator for 28.636 MHz, teamed with a TS-820 and beam antenna. Moody said the beam was a hand-me-down which had fallen off a tower. "I patched it back together with hose clamps, copper, and aluminum tubing, and stuck it back up in the air on top of a telephone pole." Hardly a high tech effort. However, Moody used a Tektronix 2213 oscilloscope to measure the little rig's output voltage into a 50-ohm load to calculate his output power.

Bill Smith WA6YPE of Glendora, California, was his partner for many low-power experiments. Moody said they would link up and then reduce power until communication ceased. "We were able to communicate every day with less than 2 milliwatts between Palestine, Texas, and Glendora, California."

They created signal strength plots using an old x-y plotter that Moody picked up at a swapmeet, getting on the air for an hour from 2300Z "until the band went out." Smith would then send Moody a solid carrier at 3 watts for seven minutes, identify himself, and then send a signal for seven more minutes. They learned that the band would exhibit rapid gains and losses in signal strengths toward the end of the day.

Smith said, "We were able to use these plateaus that were maybe 20 seconds long as the times we were able to transmit and receive over this distance." He learned when to tell Moody to transmit just by how the band sounded.

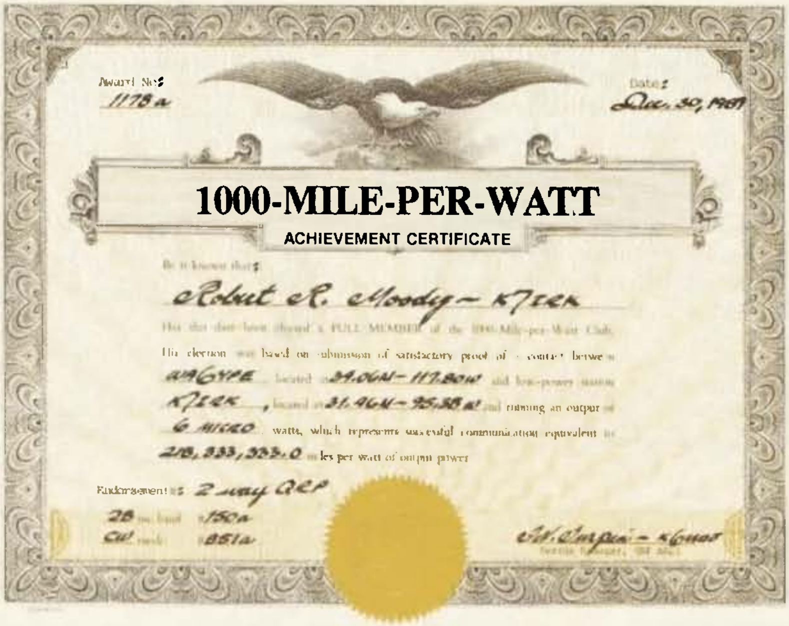
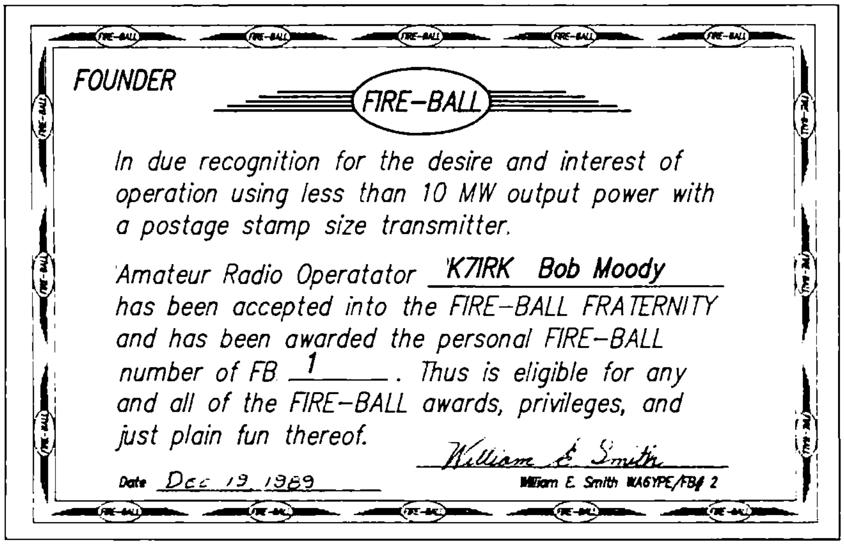


Photo B. World Record award for 218,333,333 miles per watt!

Far-Reaching Interest

Interest in their experiments even reached across the Pacific Ocean. Moody's Hawaiian contact, George Susterich KH6DXO, president of the Kauai Amateur Radio Club, recalled talking with him on CW. "It was real solid, clear copy." Susterich also remembered his own milliwatting efforts: "Nobody else would listen to a weak signal like that," except for his neighbor, four blocks away.


FOUNDER

FIRE-BALL

In due recognition for the desire and interest of operation using less than 10 MW output power with a postage stamp size transmitter.

Amateur Radio Operatator K7IRK Bob Moody has been accepted into the FIRE-BALL FRATERNITY and has been awarded the personal FIRE-BALL number of FB 1. Thus is eligible for any and all of the FIRE-BALL awards, privileges, and just plain fun thereof.

Date Dec 19 1989

William E. Smith

William E. Smith WA6YPE/FB# 2

Photo C. Fire-Ball certificate.

Jack McKenzie N7HQQ of Newport, Oregon, became a "Fire-Baller" after listening to Moody and Smith on 28.636 MHz. This became the Fire-Ball fraternity calling frequency, as it was conveniently located in the 10 meter phone segment. It was also Moody's computer clock oscillator's frequency. Most contacts were made on single sideband (SSB), and the milliwatt rig was then switched in for a CW contact. The production Fire-Ball operates on 28.060 MHz, the 10 meter QRP frequency.

When McKenzie got his rig, it had no name. When he got on the air and said, "I'm on with the Fire-Ball," the name stuck. On December 1, 1989, McKenzie worked JM1PPQ in Japan with his rig, after initiating the contact on SSB at an unreasonably powerful 1½ watts!

McKenzie, who works QRP "almost exclusively," notes one of the drawbacks of milliwatting: "People don't realize what you can do with the low power, and some of them almost come out and call you a liar when you tell them!"

People enjoy very low power operation, McKenzie added, because routine becomes challenge. If he talked to New York on 100 watts, it was ordinary; but, "If I do it with less than a watt, or on 10 milliwatts, I've accomplished something."

More QRP Fraternity

Another Fire-Baller, Dick Pursley ND3G of Greensboro, Maryland, started milliwatting from working with Bill Smith. He later worked an Oregon station, both of them using Fire-Balls on 28.060 MHz.

Since the Fire-Ball comes without a case, Pursley mounted his, complete with battery, in a L'Eggs™ pantyhose container. Although his luck was not as good as McKenzie's, he still worked over 3000 miles. As he said, "It's really a tremendous thrill when you make a contact with it."

One contact involved a Swedish milliwatter who Pursley contacted with 5 watts. The Swedish station ran 500 milliwatts and Pursley had no trouble copying him. "Absolutely Q-5, he was probably 549 or 539." Pursley scheduled a contact with him for the following week to try out his Fire-Ball, but the vagaries of propagation prevented a second contact.

Pursley has been an amateur for 13 years. Echoing Susterich, he said one of the secrets is simply to have people willing to listen for the signal. Atmospheric conditions also play a major part, he emphasized. "Without the band cooperating, you can forget it; at times even with 100 watts, you can forget it."

At the time of this writing, 10 meters has entered into what Pursley called "the summer doldrums." He looks forward to this fall, when he believes many people will be on the air with the Fire-Ball transmitters. Throughout his amateur career, he says, he gets the most pleasure from milliwatting. "It's really a thrill. This really gets your blood pumping when you work someone that's running 10 milliwatts, and so are you."

Fred Turpin K6MDJ of Cedarpines Park, California, former awards manager for the QRP Amateur Radio Club, International (QRP ARCI), issued Moody's 1000 Mile-per-Watt awards.

Turpin credits Moody's successes to operation during the "surge" prior to band shutdown. "There's a definite window there, just before the band shifts, that's wide open."

Good Atmospherics

The latest published propagation reports suggest that the sunspot cycle peaked during 1990. Peak years aid no one more than the low-power DXers, and show up most dramatically on 10 meters. Turpin said that while it's a heyday now, when the sunspot cycle diminishes and foreign contacts come with difficulty, QRPers "start leaning into their rigs"; they use higher power.

Despite this sober viewpoint, Turpin has enjoyed milliwatting more than most. For the 1984 Hootowl Sprint, he built a handbook 700 mW transmitter, and he remembers working about 20 states with it. It was "about the best thing I ever achieved."

Another time, he said, he borrowed a 750 mW walkie-talkie for 40 meters, and worked the whole East Coast one night on sideband (voice).

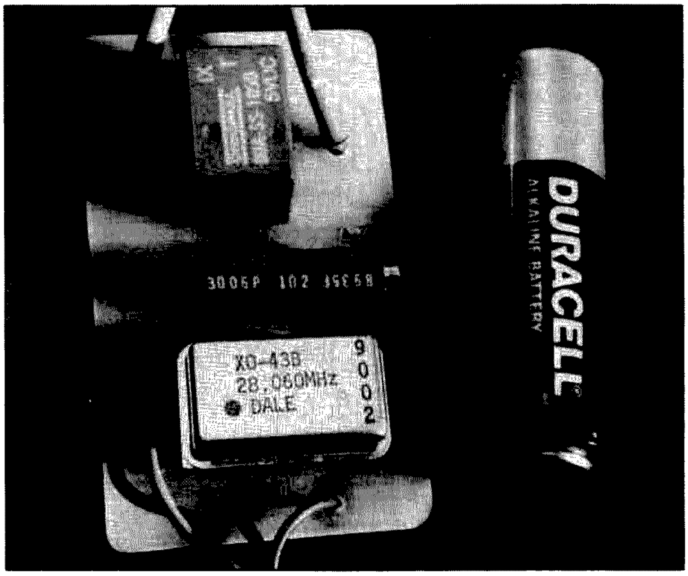
Moody also gives due credit to sunspot-influenced atmospherics. "There are times when the bands are extremely hot, and we just happened to hit the peak of the peak." He believes that anybody with modest equipment should give it a try just to see how far they can go. Getting started requires only the twist of a knob to reduce power, or a milliwatt transmitter such as the Fire-Ball. *[Ed Note: See the Fire-Ball construction article in this issue.]* Smith and Moody had so much fun milliwatting, they went into business selling the little transmitters. Moody builds them, and Smith handles the paperwork. Those interested in acquiring a kit or pre-built Fire-Ball may contact Bill Smith, Smith Enterprises, 408 E. Mauna Loa, Glendora CA 91470 Phone: (818) 963-0079, or listen for the gang on 28.060 or 28.636 MHz around 2300Z to band closure. ■

You may contact John Devon, technical editor for QRP Quarterly, *at PO Box 3236, South Pasadena CA 91031.*

The FIRE-BALL QRP Rig

50 milliwatts of pure power.

by Bill Brown WB8ELK



The FIRE-BALL, a battery-operated QRP rig, is powerful in the right hands. Note its size relative to the AA battery. (Photo by Elizabeth M. Devon.)

Look inside of most computers and you may see a metal-cased IC with a frequency stamped on it. This little wonder is a complete TTL crystal oscillator circuit, all hermetically sealed in a package the size of a 14-pin IC. If you look carefully in the parts bins at your local hamfest, you may find a pile of these oscillators. It turns out that some of them resonate in the ham bands!

Bob Moody K7IRK found a few of these gems at the local surplus house on 28.636 MHz (a popular computer frequency). Although they are designed for 5-volt operation, he found that he could run his off of four AA batteries (6 volts) and obtain nearly 50 milliwatts of output. With the addition of a 1k potentiometer to adjust the power level, and a relay to allow break-in operation, Bob came up with the FIRE-BALL QRP rig (see Figure 1). The output power can be adjusted from a high setting of 50 or 60 milliwatts down to a very low 100 microwatts for those ultimate QRP contacts.

Fifty milliwatts may not sound like much to work with, but during a good band opening you can really make some solid contacts and actually move S-meters up a few notches. Recently I tried to listen for Bob's signal clear down into the low microwatt levels. I was actually able to hear a faint but readable signal at 10 microwatts. The distance between Bob's QTH in Palestine, Texas, and our location in Hancock, New Hampshire, is 1502 miles. This works out to over 150 million miles per watt! When he turned the rig back up to 2 milliwatts, it was just like he'd fired up a high power linear amp!

Construction

Only three components comprise the FIRE-BALL. The heart of the system is the crystal oscillator module (if you can't locate one in the ham bands, contact Bill Smith WA6YPE at the address given in the parts list; Bob and Bill had a bunch made for the 28.060 MHz QRP frequency). All of the corners of the module are rounded except for one pointed corner. This is pin 1 of the oscillator. Sometimes a dot is printed on the top of the module next to pin 1 as well. Pin 1 has no connection to it, pin 14 goes to +Vcc, pin 7 is ground, and pin 8 is the output.

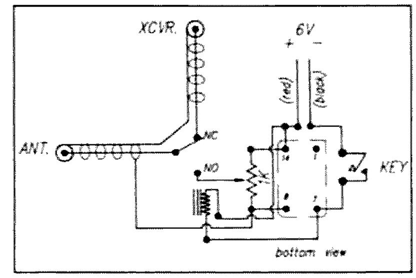


Figure 1. FIRE-BALL schematic diagram.

The 1k potentiometer is wired up to attenuate the output level from the rig. The rather unorthodox hookup was necessary in order to achieve maximum power from the module. Please note that you should use only battery power to run the FIRE-BALL, and you can mount it in a plastic case (Bob is still running his rig from the original battery pack after one and a half years of operation). In any case, make sure you don't hook up the battery ground lead to the coax shield. Smoke won't fly if you do this, however the maximum output power will drop to 20 milliwatts or so and the current drain will double.

Finally the T/R relay allows full break-in operation. It will handle about 100 watts from your big rig to establish your initial contact. However, if there is any SWR on your antenna system, it may be wise to limit the power through the relay to 75 watts or less.

Calibration

You can accurately measure the output power of the FIRE-BALL if you have an

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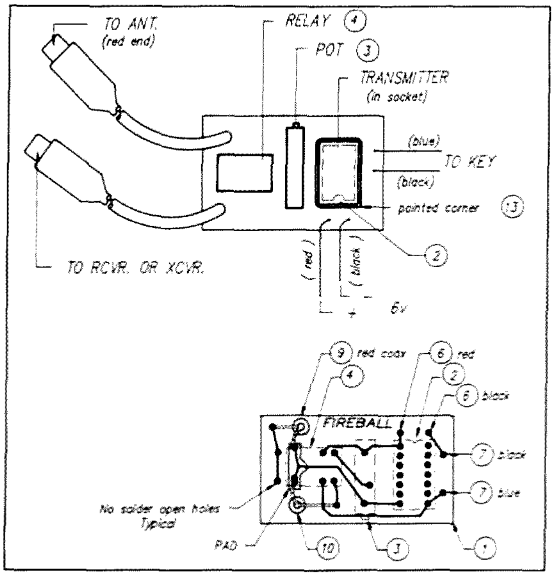

Figure 2. (a) Parts placement (top view) and (b) parts placement (bottom view).

oscilloscope capable of greater than 30 MHz bandwidth. Attach your fireball up to a T-connector that is terminated with a 50-ohm dummy load. Hook this up to your scope input. Measure the peak-to-peak voltage while keying the FIRE-BALL. To determine your output power, use the following calculations:

1) Calculate peak voltage (Vp = Vpp/2)
2) Calculate RMS voltage (Vrms = 0.707•Vp)
3) Square the RMS voltage and divide by the load resistance $(Vrms)^2/50$
4) You now have your output power in watts!

Combined formula:

Power in Watts = $(0.707 \bullet (Vpp/2))^2/50$.

Note: To check your calculations, a 2 volt peak-to-peak voltage reading indicates an output power of 10 milliwatts (0.010 watt).

If you don't have access to an oscilloscope, you can construct a 6.4 milliwatt LED standard (See Figure 4). The LED and ⅛ watt resistors can be mounted inside of a female RCA shielded plug and attached to the FIRE-BALL antenna lead for calibration. Adjust the FIRE-BALL's attenuator potentiometer until the LED barely lights. Your rig is now set for 6.4 milliwatts. Just turn the attenuator pot ½ turn to the left for a 10 milliwatt output. For more immediate readings a more elaborate calibration meter can be built (see the "Firecaler Milliwattmeter" this issue).

A quick and fairly accurate way of finding the 10 milliwatt level on the FIRE-BALL is to turn the potentiometer fully counter-clockwise for maximum power. Then turn the pot 3½ turns clockwise—you should now be very close to 10 milliwatts output.

Operation

Hook up the two cables from the FIRE-BALL to your antenna and to your rig. Attach a CW key and prepare to have a great time chasing down milliwatt QSOs. Now that Worked All States (WAS) has been accomplished with 2 milliwatts, why not try for the milliwatt WAC or DXCC awards!

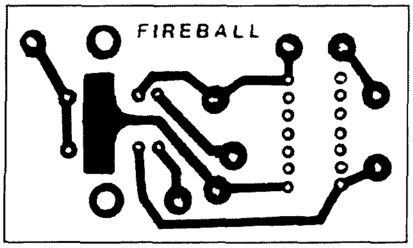

Figure 3. PC board foil pattern.

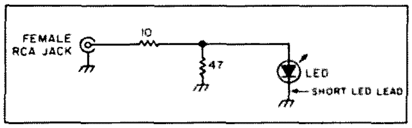

Figure 4. 10 milliwatt LED calibrator.

Parts List

FIRE-BALL:

Crystal oscillator module

1	1k, 15-turn pot	RS 271-342
1	5-volt relay	RS 275-243
2	shielded cables	RCA plugs or BNC connectors
1	PC board	

LED Calibrator:

1	LED	RS 276-033
1	47 ohm ⅛ or ¼ watt resistor	
1	10 ohm ⅛ or ¼ watt resistor	
1	female RCA phono jack	RS 274-338

A kit of all parts for the FIRE-BALL, including the PC board, crystal oscillator on 28.060 MHz, and a FIRE-BALL membership certificate is available for $24. The assembled and calibrated unit is $36. A pre-calibrated LED power standard is available for $10. Please add $2 for postage. California residents please add sales tax. To order, contact Bill Smith WA6YPE at Smith Enterprises, 408 E. Mauna Loa, Glendora CA 91740. Telephone: (818) 963-0079.

The Firecaler Milliwattmeter

Calibrate your mini-QRP rig.

by Martin Beck WB0ESV

When running low milliwatt tests with the FIRE-BALL transmitter (in this issue), you need to be able to measure the output power. Not having an oscilloscope with a 30 MHz bandwidth, and only having a calibrated LED standard at 10 milliwatts, my power measurement was restricted to one value.

I tried a VTVM and RF probe, but it proved next to useless at this low power, high frequency range. Bill Smith WA6YPE mentioned this to me and I told him I thought I could design and build a meter to do the job. Thus the Firecaler (FIRE-BALL Calibrator) was born.

The Firecaler has two ranges: 0–10 mW and 0–100 mW, and operates from a 9-volt battery. It has a face plate mounted potentiometer to zero the meter as the battery voltage decreases with use. Zero the meter with no RF applied, and turn the pot dial clockwise until the pointer just reads 0—*do not go any further.* First, calibrate your FIRE-BALL to 10 mW using an LED standard (see the FIRE-BALL article in this issue). The 10 mW test signal can be obtained from a signal generator as well. Hook up the antenna output lead from the FIRE-BALL transmitter to the Firecaler power test jack. Key your transmitter and turn on the milliwattmeter. Switch to the 0–10 mW range, adjust the thumb turn pot on the right (cut a hole in the bottom of the Firecaler for easy access) to read full scale at the 0–10 mW range (full scale = 1.0 on the meter).

Then switch to the 0–100 mW range and adjust the left pot until the meter reads 0.1. The Firecaler is now calibrated, and you can adjust your FIRE-BALL pot to whatever RF output level you want to, or you can accurately measure the power that you were running on that last QSO—the one you made when you kept turning the power down, and the other guy was still copying you.

For those of you who really want a challenge, and work in the microwatt levels, there is also a built-in −20 dB attenuator that you can transmit through. Thus, 10 mW set on the milliwatt meter will be 100 microwatts when run through the attenuator.

PARTS

R1 & R2 are linear taper pots
D1 & D2 are 1N914 or 1N34
.01 capacitors are disc ceramic
M1 meter is 0-1 MA. DC.
R3 is 1k, linear taper
J1,J2,J3 are RCA phono (females)
R4 = 62 Ω 1/4 W. matched
R5 = 240 Ω 1/4 W. coverd W/ spagetti
MPF-102
S1 = SPST switch
S2 = DPDT switch
TERMINAL STRIP Cut as reqd.
1/8" BRASS or COPPER TUBING x 7/8" long.
BOX 2" x 4" x 7" plastc W/ alum. face.

NOTE: MOST OF THE PARTS WITH THE EXCEPTION OF THE METER AND THE ATTENUATOR RESISTORS SHOULD BE AVAILABLE FROM RADIO SHACK INCLUDING THE PLASTC BOX WITH ALUMINUM FACE PLATE.
CUT A 1" DIA. HOLE IN BOTTOM OF BOX FOR ACCESS TO THUMB TURN POTS.

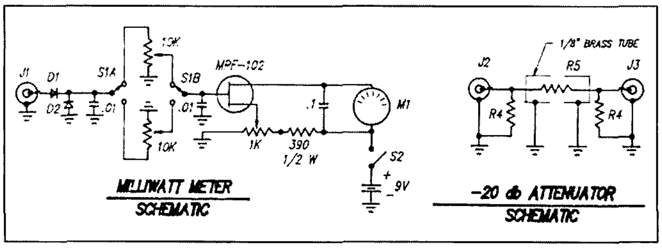

Figure 1. Milliwattmeter schematic.

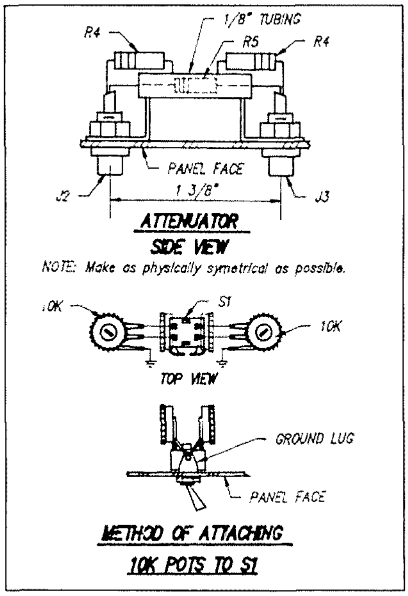

Figure 2. Attenuator and adjustment parts placement.

Some Don'ts

Don't transmit over 100 milliwatts through the milliwatt meter or attenuator. This means NO break-in operation. Use a manual switch in your antenna coax to switch to a receiver on receive, then switch to the FIRE-BALL with attenuator for transmitting.

Don't use an old 9V battery. The meter readings are only accurate with a good fresh battery. The Firecaler draws 5–10 mA when on, so when in doubt, give that used battery to the kids and get a fresh one. ■

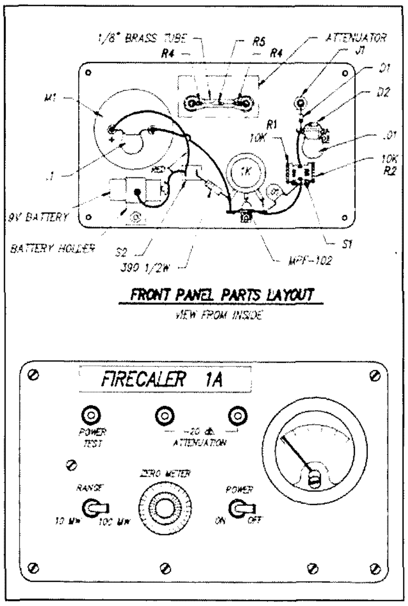

Figure 3. Front panel parts placement.

Martin Beck WB0ESV, 1637 Hood, Wichita KS 67203.

The Smoke Detector Receiver

Turn the FIRE-BALL into a complete transceiver.

by Martin Beck WB0ESV

While building the FIRE-BALL QRP rig (see the FIRE-BALL QRP article this issue), I decided it would be great to have a companion mini-receiver. After some experimentation one night, I developed the "Smoke-Detector" receiver which hooks up directly to the FIRE-BALL transmitter. With the addition of a switch and a pair of headphones, I now have a miniature crystal-controlled transceiver which I can take just about anywhere!

Circuit Description

I designed the receiver to use a minimum amount of components but still provide good performance. During receive, the output of the FIRE-BALL is used as the local oscillator (L.O.) input to a 40673 mixer stage. The received signal is amplified by the MPF102 preamplifier stage and mixed with the FIRE-BALL L.O. signal in the 40673. The resulting direct conversion audio is amplified to headphone levels by a 2N2222 audio stage.

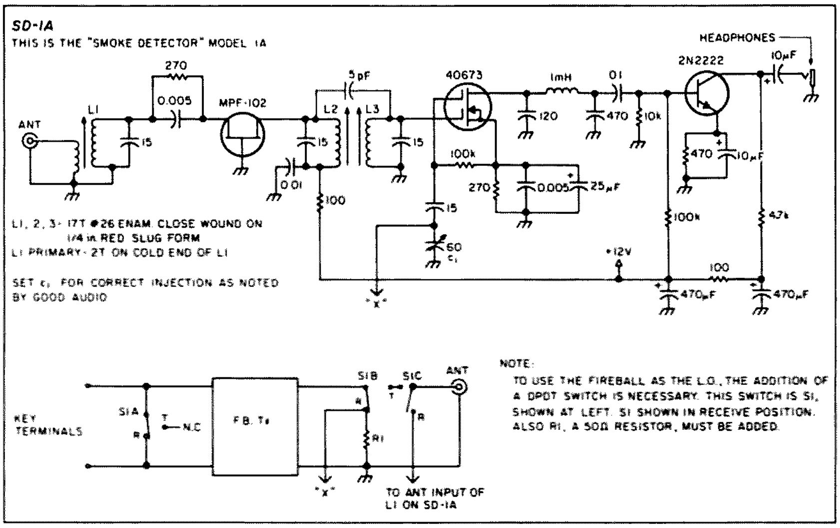

Figure 1. Schematic diagram of the Smoke Detector receiver.

Construction

Construction was done on perfboard with point-to-point-wiring. L1, L2 and L3 consist of 17 turns #26 enamel-covered magnet wire close wound on a ¼" J.W. Miller coil form with a red tuning slug. The primary of L1 is 2 turns of #26 enameled wire wound around the cold end (ground end) of L1. If the J.W. Miller coil forms are difficult to obtain, you can wind the coils on ¼" plastic tubing or rod material. However, you would then have to attach a 50 pF variable capacitor in series with the 15 pF capacitors that are located across each coil. Be aware that tuning may be more critical with this method and the Q of the tuned circuit may suffer. L2 and L3 should be mounted side-to-side about ¾" apart for best coupling. If switch S1 is hard to find, you can use a DPDT and a SPST (or SPDT) switch instead of the 3PDT switch that reroutes the FIRE-BALL output. Use the

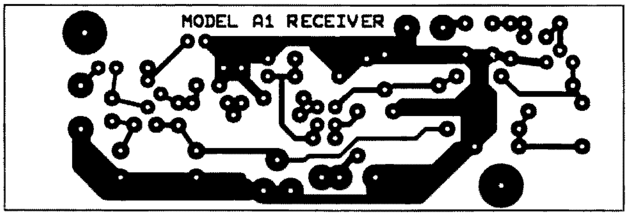

Figure 2. PC board foil pattern.

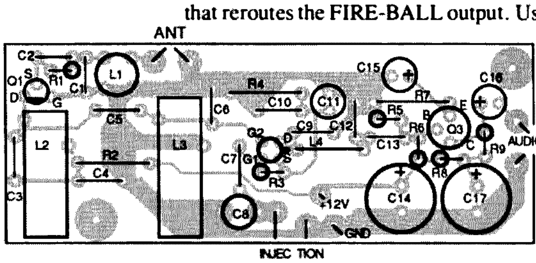

Figure 3. Parts placement.

DPDT switch to route the FIRE-BALL output to the receive mixer and change the antenna to the receive input. The SPDT (or SPST) switch then just turns on the FIRE-BALL (or you can just hold down your CW key).

Tune Up and Operation

To tune up the Smoke Detector receiver just peak up L1, L2 and L3 for the strongest received signal. Then adjust variable capacitor C1 for the best sound (too high of an injection level will distort the signal). Now all that's required for complete transceive operation is to flip just one (or two) switches. That's all there is to it. You're now ready for some real DX fun with one of the world's smallest transceivers!

You can contact Martin Beck WB0ESV at 1637 Hood, Wichita KS 67203.

Parts List.

1	MPF102 FET, RS#276-2062	
1	40673 FET, Circuit Specialists or JAMECO	
1	2N2222 transistor, RS#276-2009	
2	100k ¼ watt resistor	
1	10k ¼ watt resistor	
1	4.7k ¼ watt resistor	
1	470 Ω ¼ watt resistor	
2	270 Ω ¼ watt resistor	
2	100 Ω ¼ watt resistor	
R1	51 Ω ¼ watt resistor, Mouser 29SJ500-51	
2	10 μF electrolytic capacitor	
1	0.1 μF ceramic disc capacitor	
1	0.01 μF ceramic disc capacitor	
2	0.005 μF ceramic disc capacitor	
3	470 pF ceramic disc capacitor	
1	120 pF ceramic disc capacitor	
4	15 pF ceramic disc capacitor	
C1	6–50 pF variable capacitor, RS#272-1340	
S1	3PDT switch, Mouser# 10TC280 (a DPDT and SPST can be substituted)	
1	1 mH choke, Mouser# 43LH210 or ME434-1250 (also Circuit Specialists# 70F103AI	
L1, L2, L3	17 turns #26 enameled-covered magnet wire close wound on J W. Miller slug tuned ¼" core (red slug) James Millen coil form #69057 can be used as well	
1 roll	#26 guage magnet wire, RS#278-1345	

A blank PC board is available for $3 + $1.50 postage from FAR Circuits, 18N640 Field Court, Dundee, IL 60118.

Supplier addresses:

Mouser Electronics
P.O. Box 699
Mansfield, TX 76063
(800) 346-6873

Circuit Specialists, Inc.
P.O. Box 3047
Scottsdale, AZ 85271-3047
(800) 528-1417

JAMECO Electronics
1355 Shoreway Road
Belmont, CA 94002
(415) 592-8097

James Millen
P.O. Box 4215
Andover, MA 01810-4215
(508) 475-7831

One-Tube QRP Transmitter

A new use for old tubes.

by M. D. Allen

Normal people build something when they need something that they can't buy. Other people, like me, start a construction project for different reasons. I buy electronic parts that interest me, then try to think of something to build with them.

This one-tube transmitter project got its start when a tube sale flyer arrived from the Antique Electronic Supply Company. A 70L7 tube was on sale. It looked interesting, so I bought 10.

The 70L7 is a dual-purpose tube. One bottle houses a diode and a beam-power tetrode. With this combination it is possible to build a crystal-controlled oscillator and power supply without using even one semiconductor. The diode section of the 70L7 and a 47 µF capacitor make up the power supply for the transmitter. The tetrode section is wired as a crystal-controlled oscillator.

The circuit was kept as simple as possible. No frequency multiplying tricks were used. The oscillator will only operate at the crystal fundamental frequency.

I used 1/16" double-sided PC board for the component board and front panel. This stuff is easy to work with and provides a good ground and good shielding. I cut out the top of a tin cookie box lid, leaving a ¼" lip, then soldered the component board to this lip, replacing the cut-out section. The front panel was soldered to the component board and to the remaining section of the lid. Screwing the component board to the open side of a chassis box, if you have one, would be less work than modifying a cookie tin.

Circuit Description

The earth ground of the power cable (green wire) is connected to the chassis. Key jack J1 is the type that closes the circuit when the plug is removed, enabling the transmitter when the key is unplugged, and permitting the operator to tune up or troubleshoot without holding the key down.

Resistor R3 provides cathode self-bias and resistor R1 drops the screen voltage, limiting the plate current to a safe value (approximately 50 mA) when the oscillator is not running. A plate current of 50 mA is only 10 mA greater than the 70L7's "Class A" rating, so the tube will not go up in flames during tune-up. Do not leave the tube in this condition for more than a few minutes at a time, because 50 mA on the plate does exceed its rating. Resistor R2 provides a DC return for the control grid. Capacitors C1 and C2 bypass RF to chassis ground. Without these capacitors RF would appear at tube pins 4 and 6, lowering the gain of the tube and preventing oscillation. The values of C2, C3, and R3 will affect the keying characteristics of the transmitter.

Switch S2 shunts the plate milliamp meter during transmission. Shunting the meter will prevent it from being beat up during keying. The tank circuit has a shunt feed using RF choke RFC1 and capacitor C5. This keeps the DC plate voltage off the tuning capacitor and the tank coil L1.

I wound the tank coil L1 on a 1.25" diameter plug-in coil form. A cardboard tube from a roll of T-paper will work just as well if it is dipped in shellac or varnish. A T-paper roll is 1.5" in diameter, so fewer turns of wire are required. The L1 winding of the coil consists of 18 turns of #24 solid enameled wire, spaced over 1.25". The output link L2 has 2.5 turns of #24 insulated hook-up wire wound over the ground (cold) end of L1.

If you want a pi output, add a 3- or 4-gang capacitor to the circuit, as shown in Figure 2. The 70L7 requires 70 volts at 150 mA to light the filaments. The 10 watt 300 ohm resistor R4 drops the line voltage from 115V to the 70V required by the tube filaments. The 365 pF tuning capacitor C6 was salvaged from an old tube radio.

Only one section of the tuning capacitor is used. The larger section will be the closest to 365 pF. With the coil and tuning capacitor specified, the tuning range will be approximately 3 MHz to 10 MHz. Feel free to substi-

Continued on page 29

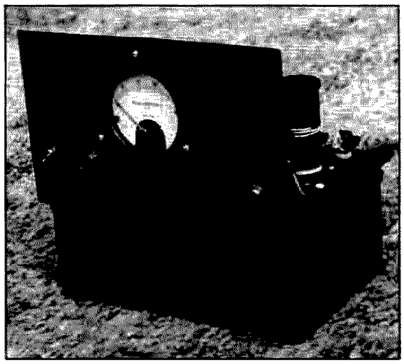

Photo A. Front panel view.

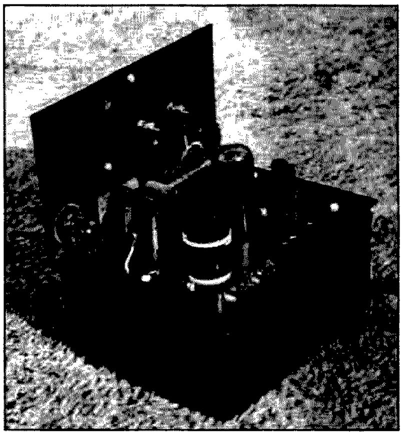

Photo B. Internal view of transmitter.

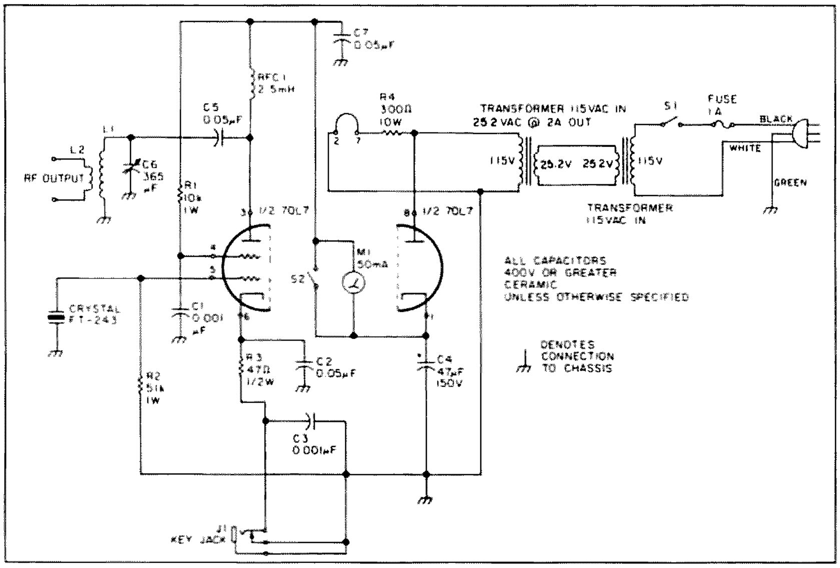

Figure 1. QRP Transmitter with link output.

Continued from page 26

Pin Numbers for Substitute Tubes

Tube Number	70L7 117L7	117M7 117N7	117P7
Cathode Diode	1	1	8
Heater	2	2	2
Plate Tetrode	3	3	3
Grid 2	4	5	5
Grid 1	5	4	4
Cathode Tetrode	6	8	6
Heater	7	7	7
Plate Diode	8	6	*

Pin changes if substitute tubes are used in the rig. When using the 117 series of tubes, please note that the 300 ohm resistor R4 should be removed.

*The diode plate is internally connected to the heater pin 7 for the 117P7 and 117N7.

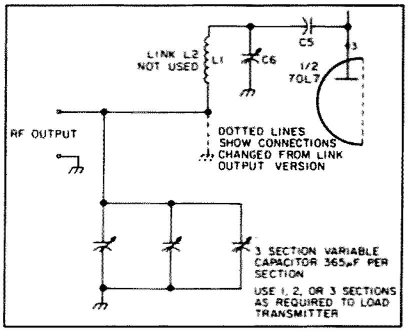

Figure 2. QRP transmitter modified for pi output.

Parts List

R1	10k	1W resistor
R2	51k	1W resistor
R3	47 ohm	½W resistor
R4	300 ohm	10W resistor
C1,3	0.001 µF	ceramic capacitor
C2,5,7	0.05 µF	ceramic capacitor
C4	47 µF/150 volt	electroylic capacitor
C6	365 pF	variable capacitor Antique Electronic Supply #CV-230 or Radiokit #BC-01
RFC1	2.5 mH	RF choke
Y1	FT-243	crystal
J1	Key Jack	
L1	18 turns	#24 enameled wire
L2	2.5 turns	insulated wire around cold end of L1
Tube	70L7 (117M7, 117L7, 117P7 and 117N7 can be substituted)	
M1	50 mA	panel meter
T1,2	Two 25.2V transformers connected together as an isolation transformer. Any pair of the Radio Shack heavy duty power transformers can be used. RS #273-1511, 273-1515, or 273-1512. You can use a regular isolation transformer if it's available. (Must handle at least 30 watts.)	
Misc. hardware		

Parts Suppliers

The Electronic Goldmine, PO Box 5408, Scottsdale AZ 85261. (602) 451-7454. Miscellaneous parts, resistors, capacitors, copper clad board.

JAN Crystals, 2341 Crystal Drive, Box 06017, Fort Myers FL 33906-6017. (800) 526-9825.

Antique Electronic Supply, PO Box 1810, Tempe AZ 85281. (602) 820-5411. Tubes, tube sockets, tuning capacitors, coil forms.

Radiokit, P.O. Box 973, Pelham, NH 03076. (603) 437-2722.

tute parts—only the value of R4 should not be changed.

The Transmitter

To check out the transmitter, plug in the coil, crystal, and tube. Open S2 so that the meter will read plate current. Set C6 to maximum capacity. Do this check out with no load connected to the transmitter. Next, turn on the transmitter. After a few seconds the tube cathodes will begin to glow and the plate meter will climb to approximately 50 mA. Rotate the tuning capacitor C6 toward minimum capacitance. When C6 and L1 reach the resonant frequency of the crystal, the plate current will take a sudden dip to 15–20 mA. The oscillator should now be running, but if the actions described above do not occur, try another crystal or tube. If all else fails, check the wiring. You can confirm power output by connecting a type 47 pilot lamp to L2. The lamp will light when the oscillator is running.

The transmitter will put out maximum power when C6 is adjusted for maximum dip in the plate current. At this point the transmitter is on the hairy edge of going out of oscillation, so continue rotating C6 toward minimum capacitance until the plate current increases 2 or 3 mA above the dip current. This will assure that the transmitter will key correctly. Properly loaded into a dummy load or antenna, the plate meter should indicate 30 to 40 mA.

Consult the ARRL handbook for details on antennas. A half-wave dipole connected to the transmitter with a length of RG-59 should work well with the loop coupling. Experiment with the number of turns on the coupling loop (L2) to get the most power to the antenna. If you've used a random length of wire for an antenna, use the pi output. The transmitter should put out between 1 and 1.5 watts. QRP frequencies that can be used with this rig are 3.560 and 7.040 MHz. 10 MHz operation is also possible.

Which Tube Pin is Which?

It has occurred to me that there may be someone out there who has never built anything with tubes. How do you determine which tube pin is which? The 70L7 has an octal base, which means that it has 8 pins and a large nonmetallic locating pin in the center of the base.

Hold the tube with the base up. Locate the indexing ridge on the center pin. Counting clockwise from the indexing ridge, the first pin is #1. All of the older ARRL handbooks have tube data and base diagrams.

I still have nine more 70L7 tubes in the junk box. What next? Maybe a direct conversion or regenerative receiver? ■

M.D. Allen, Toro Electronics, PO Box 567, El Toro CA 92630.

TTL Transceiver for 40 Meters

The logical choice for QRP.

by Rick Lucas WB0NQM

This little QRP transceiver is a lot of fun to build, and you don't have to have years of experience in electronics to build it.

Here are a few building hints:

When you use a 6V regulator the final IC must have a heat sink (See Figure 1). I used a small amount of superglue to mount the heat sink to the top of the IC to conduct away the excess heat. Remember these devices are current amplifiers. *[Ed. Note: An appropriate IC heat sink (part number 33HS016) is available from Circuit Specialists, P.O. Box 3047, Scottsdale AZ 85271-3047. Phone (800) 528-1417.]*

The 8 µH choke helps keep RF out of the power supply. I powered everything from a 12 volt battery. A 7806 regulator provides 6 volts to the TTL section. For those of you who don't like the idea of running TTL circuitry from 6 volts, just replace the 7806 with a 5 volt regulator (7805 type).

The sensitivity of this rig is somewhere around 1 µV; however, this depends a lot on your antenna. A good antenna system, such as a vertical or beam, helps the performance of the rig. Remember that this rig is a direct conversion receiver.

The selectivity of this rig is only fair. The problem is that the mixer is a pair of diodes, which makes the stage passive. If your crystal is close to a shortwave station, the commercial station may be louder than the station you are trying to receive.

The transmitter is keyed through the 8 µH choke. This helps prevent spikes.

The output of this rig using 5 VDC is approximately 250 mW;using 6 VDC, it's about 360 mW.

Tuning the output pi-network requires an SWR bridge (0-5 watt range) and a dummy load (2-100 ohm 1 W resistors in parallel). Tune coil L1 to maximum reading, then back off ¼ turn.

The crystals are fundamental frequency. Crystals in the more modern HC/6, HC/18 or HC/25 holders work better than FT-243 crystals. If ordering a new crystal it should be AT cut with 32 pF load capacitance, parallel resonant.

You can have a lot of fun with this rig. However, remember it won't compete with the high priced rigs. ■

Rick Lucas WB0NQM, 412 Cattleman Ct., Lawrence KS 66049. The above material was previously published in the SPRAT *and* Lo-Key *journals.*

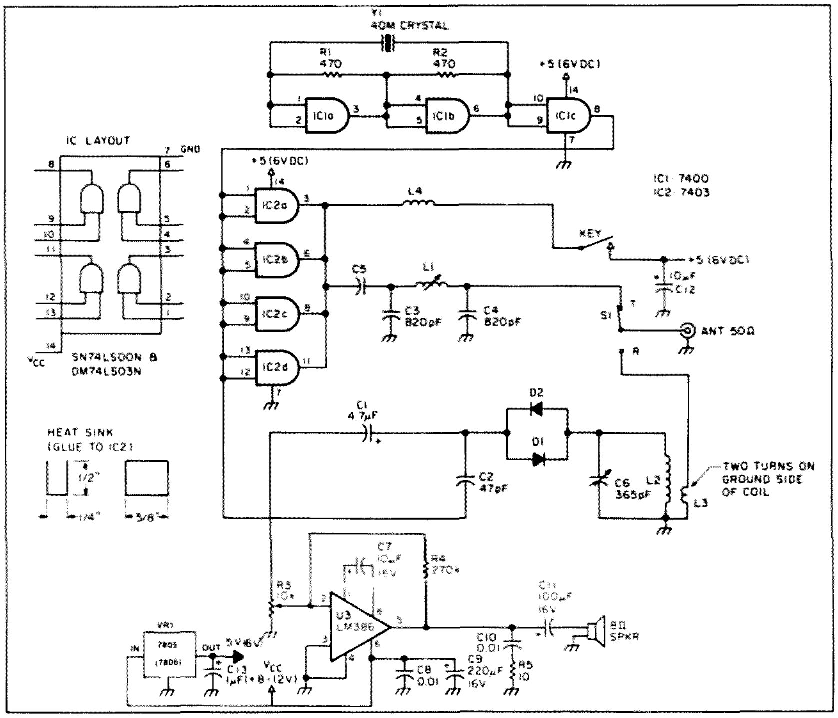

Figure 1. Schematic of the TTL transceiver.

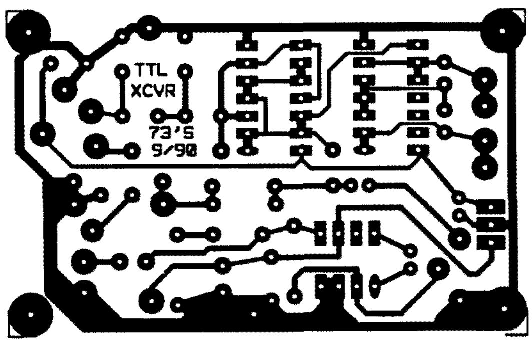

Figure 2. PC board foil pattern.

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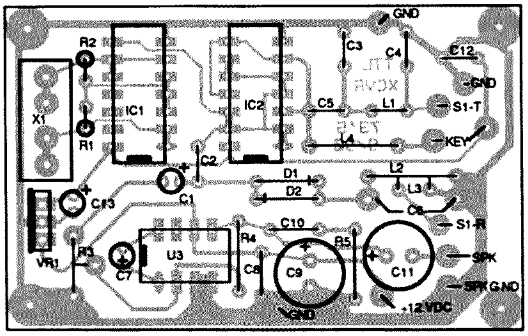

Figure 3. Parts placement.

Parts List

R1,2	470 ohms	½W	
R3	10k ohm	pot	
R4	270k ohm	¼W	
R5	10 ohm	¼W	
C1	4.7 µF	16V	
C2	47 pF	NPO	
C3,4	820 pF (1600 pF for 80 M)	NPO	
C5	0.01 µF		
C6	365 pF	variable	
C7	10 µF	16V electrolytic	
C8	0.01 µF	ceramic	
C9	220 µF	16V electrolytic	
C10	0.01 µF	ceramic	
C11	100 µF	16V electrolytic	
C12	10µF	tantalum	RS# 272-1436
C13	1.0µF	tantalum	RS# 272-1434
D1,2	1N914		
L1	1.0 µH (3.5 µH for 80 M)	variable (23A336RPC for 80 M) or equivalent.	Miller 23A106RPC
L2	100 µH choke	RS 273-102	
L3	two turns	around cold end of L2	
L4	8 µH choke	or higher	
S1	SPDT	miniature	
IC1	74LS00N	4th section not used	
IC2	74LS03N		
IC3	LM386N		
1	speaker	8 ohm	
Y1	crystal	32 pF load, AT cut, parallel resonant	
Heat Sink	See Figure 2		

A blank PC board is available for $3.75 +$1.50 postage from FAR Circuits, 18N640 Field Court, Dundee, IL 60018.

Note: C6 can be any transistor radio style tuning capacitor.

Goof-Proof Regenerative Receiver

One-transistor receive fun.

by Richard Lucas WBØNQM

This little regenerative receiver is as goof-proof as possible. If you want a simple and extremely small portable receiver, this may be just the answer. By changing just one capacitor, this receiver can be set up to tune various segments ranging from 4.0 to about 26.5 MHz. You can receive AM, FM, SSB or CW all from a one-transistor circuit with excellent sensitivity.

Construction

All components were mounted on perfboard. The complete receiver can be mounted in a small plastic case with a transistor radio battery to power it.

L1 consists of 25 turns of 26, 28 or 30 gauge enamel-covered wire wound on a T50-2 toroid (takes about 3 feet of wire). L1 is tapped five turns up from the ground end (25 percent of the total turns). An easy way to make this tap point is to extend an inch of wire and twist it together after winding the fifth turn. Scrape some of the enamel off of the end of the tap point and tin the wire at this point. (See Figure 2.) Continue winding the remainder of the 25 turns. This is a lot easier than trying to make a tap directly to L1 after it's been wound. L2 consists of three turns wound directly over L1 near the top end of the winding.

C1 can be any variable capacitor that has a tuning shaft with a value that at least covers 2–13 pF. I used an E.F. Johnson model 193-0004-001. C2 is mounted in parallel with C1 to determine the frequency range you desire. C2 should be a disc ceramic NPO-type capacitor to eliminate frequency drift due to temperature changes. See the table for the frequency ranges you can expect with various values of C2. I made a socket out of two pins of a single in-line IC socket (RS# 287-1975) to hold C2, which allows for easy band changing. *[Ed. note: A 365 pF variable cap can be used for C2 which allows for continuous coarse tuning.]*

If you use an 8 ohm audio transformer you can hook up a pair of headphones directly to the secondary of T1. You should have a reasonable volume level, but don't expect to have your ears blasted away! For those of you who'd like a speaker output, use a 1:1 600 ohm audio isolation transformer for T1 and hook it up to the LM386 audio amplifier circuit shown in Figure 1b.

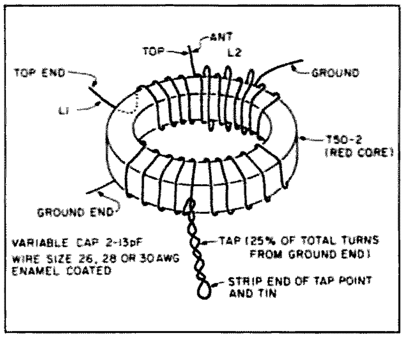

Figure 2. Toroid winding details.

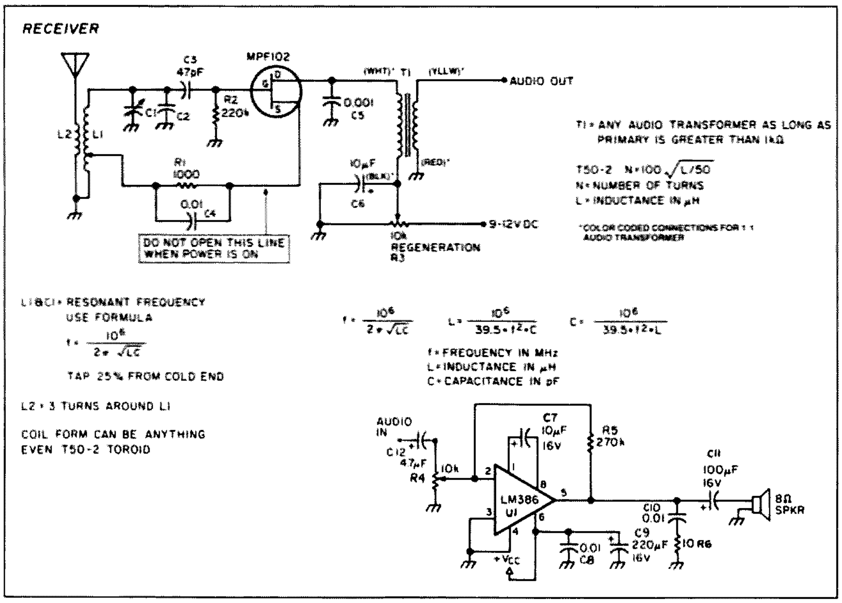

Figure 1a. Schematic diagram for the goof-proof receiver. 1b. Audio amplifier stage. Use the formulas to determine the number of turns for L1 to allow expanded frequency coverage.

Frequency Coverage Using 25-Turn Toroid

C2 value	Frequency Range
500 pF	4.0–4.1 MHz
200 pF	6.2–6.4 MHz
180 pF	6.6–6.8 MHz
*160 pF	6.9–7.2 MHz (40m)
*150 pF	7.2–7.4 MHz (40m)
130 pF	7.6–8.0 MHz
120 pF	7.9–8.3 MHz
100 pF	8.6–9.1 MHz
*82 pF	9.4–10.0 MHz (WWV)
*75 pF	9.8–10.4 MHz (30m)
68 pF	10.2–10.9 MHz
56 pF	11.0–12.0 MHz
47 pF	11.8–13.1 MHz
*39 pF	12.7–14.35 MHz (20m)
*33 pF	13.5–15.5 MHz (20m)
30 pF	14.0–16.2 MHz
27 pF	14.5–17.0 MHz
24 pF	15.1–18.0 MHz
22 pF	15.5–18.7 MHz
*20 pF	16.0–19.6 MHz (17m)
18 pF	16.5–20.5 MHz (17m)
*15 pF	17.4–22.2 MHz (17 & 15m)
12 pF	18.4–24.5 MHz (15m)

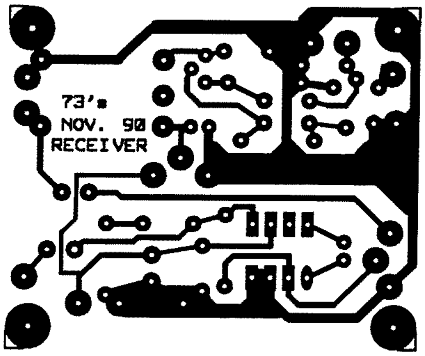

Figure 3. PC board foil pattern.

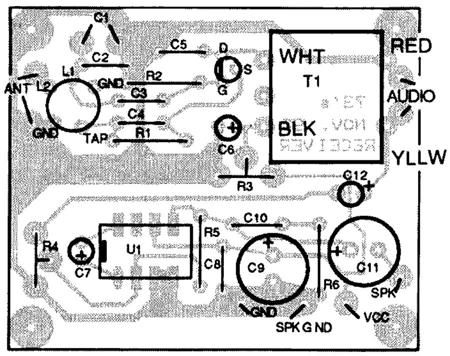

Figure 4. Parts placement (color coded leads for T1 indicated if using the 1:1 audio isolation transformer).

Parts List

Receiver

Q1	MPF102 FET
R1	1k ¼ watt resistor
R2	220k ¼ watt resistor
R3	10k potentiometer
C1	1.4–13 pF variable capacitor (E.F. Johnson #193–0004–001)
*C2	Ceramic disc capacitor type NPO (See table for values)
C3	47 pF ceramic disc capacitor
C4	0.01 µF ceramic disc capacitor
C5	0.001 µF ceramic disc capacitor
C6	10 µF electrolytic capacitor
1	T50-2 toroid core
L1	25 turns #26, 28 or 30 gauge enamel-covered magnet wire on T50-2 toroid, tapped 5 turns from ground end
L2	3 turns #26, 28 or 30 guage enamel-covered magnet wire over top end of L1
T1	1000 ohm:8 ohm audio output transformer (for headphone use): RS# 273-1380 or 1:1 600 ohm audio isolation transformer (for use with audio amplifier circuit) RS# 273-1374
1	pair of headphones RS#33-1000 (not needed if audio amplifier circuit is used)
1	roll, enamel-covered magnet wire (26–30 guage OK) RS#278-1345

Optional Audio Amplifier

U1	LM386 audio amplifier IC
R4	10k potentiometer
R5	270k ¼ watt resistor
R6	10 Ω ¼ watt resistor
C7	10 µF/16V electrolytic capacitor
C8	0.01 µF ceramic disc capacitor
C9	220 µF/16V electrolytic capacitor
C10	0.01 µF ceramic disc capacitor
C11	100 µF/16V electrolytic capacitor
C12	4.7 µF/16V electrolytic capacitor
SPKR	8 ohm speaker

The T50-2 toroid core as well as a selection of variable tuning capacitors are available from Radiokit, P.O. Box 973, Pelham NH 03076; Phone: (603) 437–2722.
A blank PC board is available for $3.50 plus $1.50 postage from FAR Circuits, 18N640 Field Court, Dundee IL 60118

Operation

Plug in capacitor C2 for the band segment you wish to tune. For AM or FM reception, adjust the regeneration control R3 until you hear a hissing sound. Then, back it off until the noise just stops. For SSB or CW reception, adjust the tuning capacitor C1 until you hear a station. Turn the regeneration control until the hissing just starts and adjust it for the best sounding SSB or CW reception. This rig is quite sensitive but don't expect the selectivity to equal your big transceiver. However, it sure is a lot more portable!

Contact Rick Lucas WB0NQM at 412 Cattleman Ct., Lawrence KS 66049. Article reprinted from the Lo-Key *and* SPRAT *journals.*

Number 16 on your Feedback card

MOuSe-FeET

A 40 watt QSK CW amplifier.

by Bill Heishman N5HNN

Most of today's home-brew hams seem to be QRPers. This is what attracted me to QRP—I am, by nature, a tinkerer. Yet, on the momentous occasion of my first home-brew to home-brew contact with fellow rosin-sniffer NZ5G, conditions were marginal. We did indeed make contact with our sidewalk sale surplus, but we could not rag-chew. So began my quest for more power. Leaving the QRP fold for a solid rag-chew may seem sacrilegious to some, but to others it might spur a renewed interest in construction.

Bruce NZ5G and I tried some of the old standby amplifier circuits found in several popular reference books and old magazine articles. The experience was great, but none of the amps we tried satisfied all of our desires: at least 20 watts output; QSK and silent (no relays); simple; cheap.

Finally, I came close with a 40 watt amp using a MRF477 (not cheap). It was monoband (simple), electronically switched (QSK) and 30 to 40 watts out. It provided some solid QSOs and lots of "great sounding rig" comments. However, it overheated quickly in the small box I wanted to use and cost more than I liked. Not perfect, but I was smugly satisfied.

While I was describing (bragging about) my newest success to the local parts merchant, he interrupted my discourse to show me his newest widget. "These are MOSFETs," he said. "I hear that they amplify RF somewhat." I became real interested since the price was less than two bucks! He carefully wrapped a couple in aluminum foil and "gave" them to me, knowing that I would be back for more.

I took the parts home, read and reread the "Three Fine Mice-MOuseFET CW Transmitters" article in the December 1986 issue of *QST*, and convinced myself that with a few circuit adaptations these higher power devices would really work. Eventually they did, and worked wonderfully. It just took time, several more MOSFETs, and practical experience in breakdown voltage, not to mention 10 to 20 fuses.

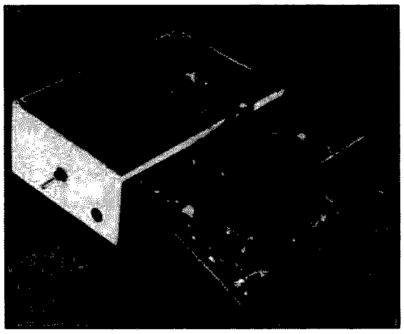

Photo A. The 40 meter MOSFET amp (Photo by Charlie Knight WI5S).

It was worth the trouble, because I ended up with an amplifier that met all our criteria. The amp was simple, very cheap, QSK, 30 to 40 watts out, and ran surprisingly cool with a modest heatsink.

Design

At this point most articles begin the complicated math and calculations used to design their circuits. However, most hams do not build this way. The design covered in this article was "hacked out" using a combination of starting values guesstimated from a reference article and practical experience.

Simply start with something close, experiment, then adjust the values. Construct this amp to go with your HW-9 and start your experience growing.

Circuit Operation

Let's ramble through the amp now and see how it works. The receive path through the amp is via the 6.8 µH choke in series with a 10–100 pF variable capacitor, tuned to resonance. D7 and D8 will decouple this circuit when the amp is transmitting, since the diodes act as open switches with very small voltages (receiving) and closed switches with large voltages (transmitting).

The transition from receive to transmit occurs when D5 and D6 sample RF from an exciter. The resulting negative potential forward biases the 2N3906 that delivers 14 volts to a 270 ohm resistor. This becomes voltage source "A," which is then fed through L7 and L5 to forward bias the "common" power diodes, D3 and D4, serving as PIN diode switches. At this moment, the transmitter is coupled to the input matching circuit, and the output matching circuit of the amp is coupled to the antenna.

If you can be satisfied with degraded receiver performance, leave out D3 and D4 and associated switching circuitry. The amp will work, although weak signal reception will suffer.

There are a few parts not covered yet. The 150 and 1500 ohm resistors provide needed stability. D1 rectifies some of the drive to provide forward bias and limits dangerous voltage excursions. R5 limits the current through D1. D2 and R7 protect against voltage spikes at the drain. This situation can occur without D2 under unusual load conditions (i.e., high SWR). With D1/R5 and D2/R7 combinations in place, this circuit is very rugged.

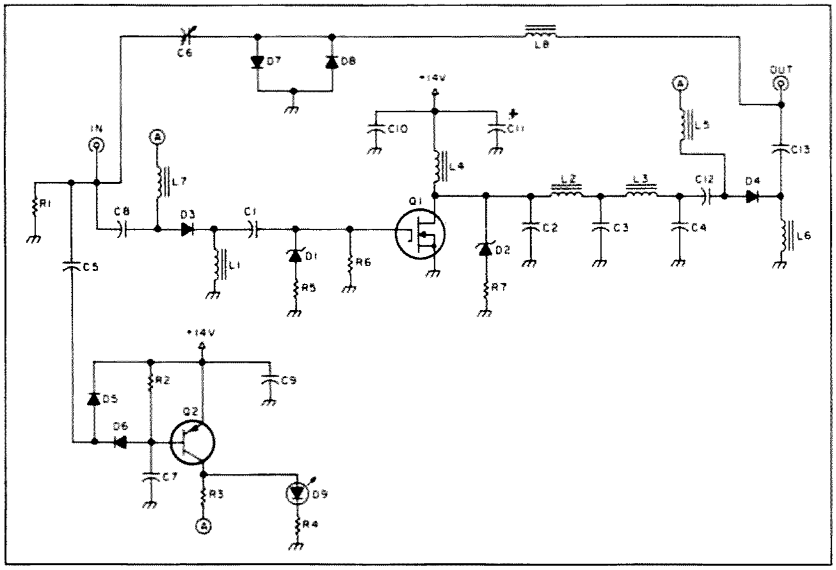

Figure 1. Schematic diagram.

Construction

Besides traditional etching, I have used two "cheap and simple" methods to prepare the circuit board. One is to cut square

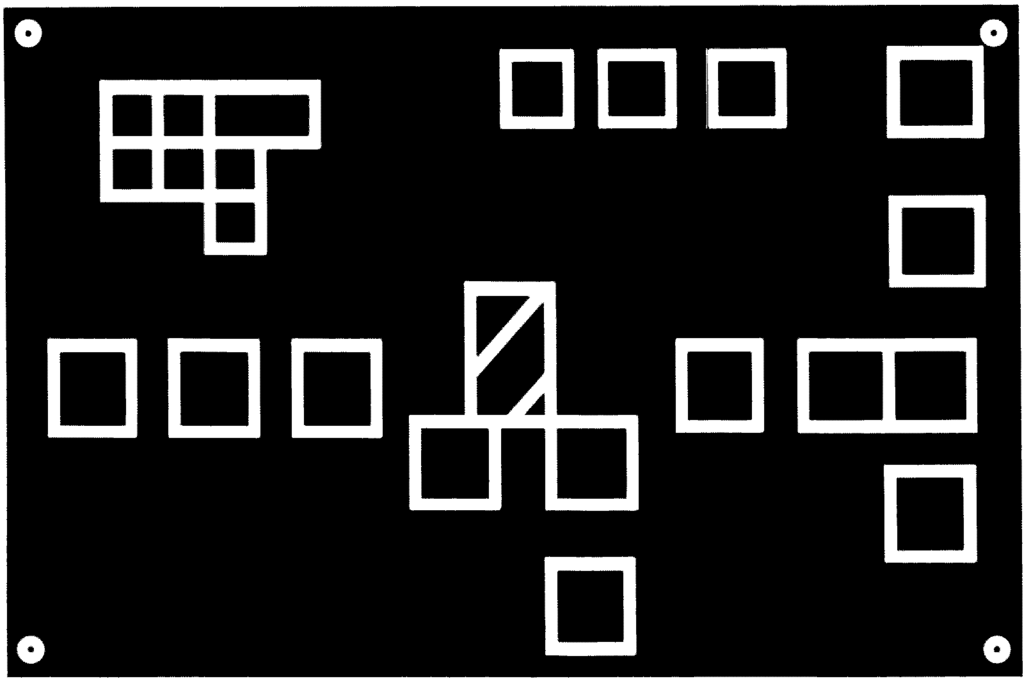

Figure 2. PC board foil pattern. Cut out hole for Q1 in center of board.

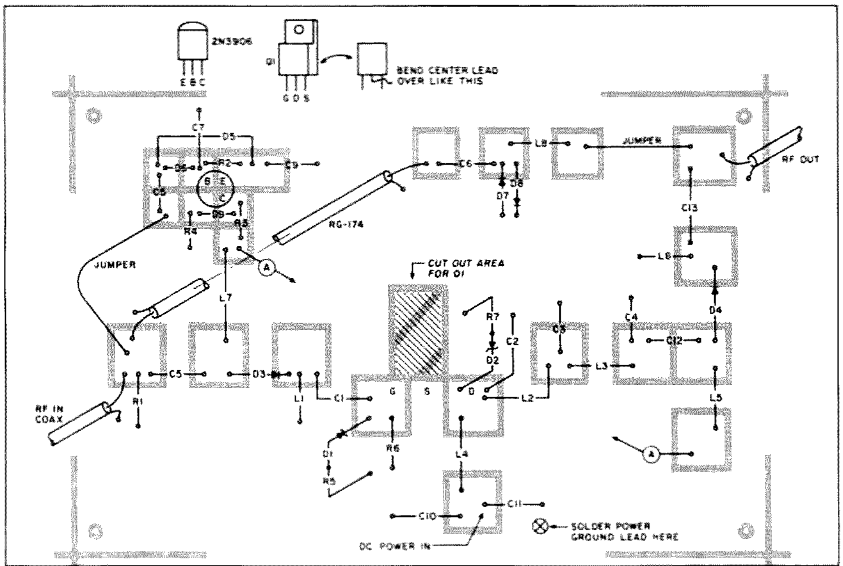

Figure 3. Parts placement. All components mounted on foil side of PC board.

pads from scrap printed circuit board the same size as the pads on the layout. Epoxy them to the motherboard in the approximate locations shown. For speed and less mess I use a rotary tool with a thick cut-off wheel. With a little practice it is very easy to zip ample gaps between solder pads and the surrounding ground plane. For greater accuracy, try tracing the layout onto the copper board first, using carbon paper behind a photo copy of the layout. Then you might as well outline those marks with a direct etch pen, fill in the gaps, and etch the board.

The final step is to cut the hole for mounting the MOSFET. The best way is to drill a 0.375" starting hole and finish up with a nibbling tool. A coping saw will also do a nice job. A 0.125" x 3.75" x 5.75" aluminum plate makes a "cheap and simple" heat sink. It also provides support and stability. Clamp the prepared board onto the plate and drill the four corner holes and mounting hole for the MOSFET. Secure the pieces together with 4-40 hardware at the corners. Now is a good time to tin (pre-solder) the pads and component leads. This is a good practice and speeds construction. Bending and trimming the leads of the components ahead of time is also a good practice. A little preparation will ensure speedy construction, uniform appearance, and neatness.

Use the component placement diagram to solder the parts in place, leaving the MOSFET for last. Refer to the schematic often to follow what you are doing. The LED might be mounted on the face of your enclosure. Route the jumpers as shown, laying them close to the board and out of the way. Mounting Q1 is no big deal. Just make sure everything is at the same potential (even you) with ground straps, alligator clip-leads, and/or physical contact. Once the device is mounted and soldered, it is very rugged and static-proof. The tab must be insulated from the heatsink and mounting screw with a mica insulator and matching plastic washer. You could substitute a nylon screw for the metal screw and plastic washer. Add a dab of silicone grease or heat sink compound (available at Radio Shack) to both sides of the mica insulator. Carefully bend the drain (center) lead up and over the source to reach its pad.

Tune-Up

Tune-up is a snap. Hook the amp up to your transceiver and peak the variable cap for maximum received volume or background noise. Use about 1 watt of drive and try a couple of short dits. Your wattmeter should move and the LED should blink. If they don't, check all the pads and make sure none of them are shorted to ground. Peak the amp by tweaking the coils on the toroids. Expect to spread the turns apart on L2 somewhat and to squeeze them together on L3. Any instability can usually be cured by adjusting L1 similarly. Increase the drive to 2 watts and peak again. With a little luck, you should get about 40 watts out with a 14 volt supply. If the output crawls with temperature, check C2–C4 for heating. I have found a few silver mica caps that could not handle the RF current in this circuit. Also, if Q1 is not heat-sinked properly, output will drop as it heats up.

Enclosure

You can build a nifty enclosure using the heat sink for the bottom. For the top, cut another piece of PCB the same size as the circuit board. I used these dimensions for the four side pieces: 2" high x 3.75" long minus two times the thickness of the board for the shorter ends, and 2" high x 5.75" long for the two longer end pieces. With square, accurate cuts these pieces are self-aligning when soldered together on the inside. Solder a 4-40 threaded stand-off into each corner. Take the mounting screws out of the corners of the amp and place the top over the board. The screws should lock the cover down over the amp. I used extra long screws and rubber feet

Parts List (40 meter amplifier)

Resistors		
R1	150 ohm	1 watt
R2	10k ohm	¼ watt
R3	270 ohm	½ watt
R4, R6	1500 ohm	¼ watt
R5	27 ohm	½ watt
R7	330 ohm	2 watt
Capacitors		
C1	1200 pF silver mica	100 volt
C2	1000 pF silver mica	1000 volt
C3	1500 pF silver mica	1000 volt
C4	750 pF silver mica	1000 volt
C5	33 pF ceramic	
C6	10–100 pF variable trimmer	
C7, C8, C9, C10, C12, C13	0.1 uF 50 V monolithic	
C11	100 uF 25 WVDC electrolytic	
Inductors		
L1	10 turns, 22 gauge enameled wire on Amidon T50-6	
L2	7 turns, 18 gauge enameled wire on Amidon T80-2	
L3	15 turns, 18 gauge enameled wire on Amidon T80-2	
L4	10 turns, 18 gauge enameled wire on Amidon FT50-61	
L5–L7	150 µH epoxy-dipped choke	
L8	6.8 µH epoxy-dipped choke	
Semiconductors		
D1	15 volt ½ watt zener	
D2	28–35 volt 1 watt zener	
D3	2.5 amp 100–1000 volt PIV power diode	
D4	3.0 amp 100–1000 volt PIV power diode	
D5–D8	1N914 or equivalent switching diode	
D9	common LED	
Q1	IRF-531 power MOSFET	
Q2	2N3906 or equivalent PNP transistor	

Parts Availability and Addresses

Most diodes, resistors and capacitors are common values and should be available at Radio Shack and similar outlets.
Toroid cores and Silver mica capacitors can be ordered from Circuit Specialists, Radiokit or Tanner Electronics.
The IRF-531 MOSFET is available from Digi-Key and Tanner Electronics.
A blank PC board and a partial kit consisting of the heat sink, the IRF-531 MOSFET, and the zener diode are available for $14.95 + $3 shipping and handling from Tanner Electronics.

Tanner Electronics
1301 West Beltline Rd., Suite 105
Carrollton TX 75006
(214) 242-8702

Circuit Specialists
P.O. Box 3047
Scottsdale AZ 85271-3047
(800) 528-1417

Digi-Key
701 Brooks Ave. South
P.O. Box 677
Thief River Falls MN 56701
(800) 344-4539

Radiokit
PO Box 973
Pelham NH 03076
(603) 437-2722

on mine. You can decide where to mount the SO-239s and feed the power cable through. A DPDT toggle switch makes a simple on/off-bypass switch. The circuit does not draw any idle current, so there is no need to switch the power on and off. Really motivated builders will mount the LED on the front through a 3/16" hole.

If this is your first project, be particular and do not try to substitute part numbers or values. All of the basic parts should not cost more than $25, about the price of just one high power RF final.

A Versatile Result

With changes in a few frequency-dependent components, this circuit should work just as well on other bands. I have tacked an experimental amp together for 10 meters with the IRF-531 MOSFET and tweaked 40 watts out of it. This means that, with the same basic circuit and identical layout, you could use this amp on any HF band (see the table for component changes). The higher frequencies will need progressively more drive, up to 5 watts on 10 meters.

Maybe a few more hams can be dragged back into home construction when they realize that solid state home-brewing no longer means a choice between low power, affordable transmitters and high power, expensive finals. There is nothing more fun than sending "...running 40 watts out with home-brew amp." ■

Table 1. Coil and Capacitor Values for 20 and 10 Meters

Part	*20m	**10m
L1	6 turns x ½" long	5 turns x ⅜" long
L2	3 turns x ¼" long	3½ turns x ¼" long
L3	9 turns x ½" long	6 turns x ½" long
L4	same as 40m	10 turns x ½" long
L8	6.8 µH	2.2 µH
C1	1000 pF	330 pF
C2	not used	not used
C3	1360 pF	500 pF
C4	250 pF	not used

*L1–L3 are 20 gauge enameled wire air wound with ⅜" diameter.
**L1–L3 are 20 gauge enameled wire air wound with ¼" diameter.

Spread or squeeze coils for final tune-up.

The Dummy Ducky

Inexpensive dummy load for your HT!

by Richard J. Molby DA1DB/WB7NZG

After untold hours of hard labor you have finally completed your new superpower antenna system. Now comes the the final tuning at the top of the tower. You call a ham friend and you decide to use 2 meter handies to coordinate the tuning effort. Your aching bones finally bring you to the top of the tower and you turn on your handie. What do you hear? Your poor little radio is getting blasted to bits by stations many miles away and you can't seem to find a clear channel. You start to wonder why handies don't have attenuators!

The solution is simple: Before climbing the tower replace the normal rubber ducky antenna with the dummy ducky antenna.

Building the Dummy Ducky

The dummy ducky will do two things: It will reduce received signal levels drastically, therefore only allowing you to hear your friend's handie from your shack; and it will reduce your effective radiated signal so you do not interfere with others on the frequency. *[Ed Note: Make sure you set your HT to the low power position since the dummy ducky is limited to ½ watt.]*

The dummy ducky is simple to build. You probably already have most of the parts: a solder-type BNC connector; a ½ watt, 50 ohm carbon resistor (a 51 ohm resistor or two 100 ohm resistors in parallel can be used as well); a ¾" length of 5/16" diameter copper tubing; a 1¼" length of ¼" diameter plastic tubing; and a 1¾" length of RG-8 outer covering.

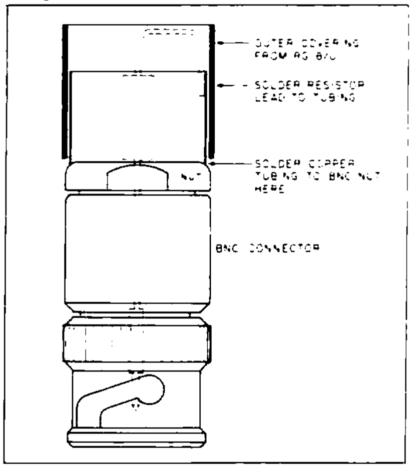

Figure 1. The dummy ducky.

The easiest way to start construction is to solder the length of copper tubing to the BNC connector nut, making sure it is vertical. Next, take the 50 ohm resistor and solder the BNC pin to one end. It may take some trial and error to get the correct lead length that will allow the BNC pin to be correctly positioned when the resistor is inserted into the connector body. The body of the resistor should be down into the connector as far as possible.

Next, slip the plastic tubing over the resistor and push it down into the tubing as far as possible. Then fold the resistor lead down over the edge of the tubing and trim it so that it just overlaps the edge of the copper tubing. Solder the resistor lead to the copper tubing. For the finishing touch, slide the length of RG-8 outer covering over the tubing and push it down as far as possible. To give as professional an appearance as possible, fill the top of the antenna with black liquid rubber and allow it to cure. The dummy ducky is now complete and ready to reduce those nasty interfering signals. 73

Contact Richard J. Molby at HHSB 4BN 9th FA, APO New York 09176.

73 Review *by Larry R. Antonuk WB9RRT*

Heathkit Adapter and Coax Cable Kits

Create your own versatile adapters.

Heath Company
Benton Harbor MI 49022
(800) 253-0570
Price Class: HCA-3001, $80; HCA-5001, $70

It's happened to everyone at least once. You're right in the middle of some complex (and highly important) test procedure, like measuring desense on a 2 meter repeater at the same time you're keying up a 440 repeater into a dummy load. You have one more cable to hook up, but you need a PL-259-to-N adapter. You reach into your tool box, and...hmmm. You were sure you had one more of those. Oh well, you can just screw together this BNC-to-N, along with this...no, that won't work. Let's see, maybe if I...no, not that either. It doesn't matter how many times you dump out that coffee can full of flea market RF adapters, you don't have what you need. You just "can't get there from here." The test has to be postponed (or altered, or fudged) until you get the proper equipment.

The HCA-3001 RF Adapter Kit

At some point, having the right tool for the job becomes important. It's either a necessity, or it's simply worth it in order to eliminate headaches. The right tool for the RF technician is now available from Heathkit.

The HCA-3001 RF adapter kit is a product that should be found under every radiohead's Christmas tree. This kit consists of two dozen adapter ends and six center pieces, packed in a zippered, leather-like case. An actual adapter is made by screwing the ends (say, one female UHF and a male N) to each end of the threaded center piece. This produces an adapter that is slightly longer than the average adapter, but much more versatile. The kit contains male and female N, F, RCA, BNC, UHF, SMA, TNC, and Mini-UHF adapter ends. This means that you can get from one to another of any of these styles, making up an adapter that Amphenol never even thought of! You can now go from a female F to a female SMA in one two-inch adapter, not the seven-inch conglomeration that you have to link together now.

The adapters all have Teflon™ insulation and gold-plated center pins. One of the nicest features is the fact that the adapters all fit in their individual slots in the case. You can tell at a glance if any of the components are missing, eliminating the "left it at the site" syndrome.

The HCA-5001 Coax Adapter Cable Kit

Once you've used the RF adapter kit for a while, you'll come to appreciate the pleasure of using just the right tool for the job. If you really want to pamper yourself, the next step is to pick up the HCA-5001 Coax Adapter cable kit. This kit consists of 20 three-foot RG-58 cables with a variety of mixed and matched connectors on each end. The styles are the same as listed above, with no SMAs, and with a couple of test clips thrown in. These connectors are the same high quality as the adapter set, and the cable is a flexible, easy-to-work-with type. And it's bright yellow, so you can tell at a glance if someone at another bench has "borrowed" one of your cables. Heathkit even throws in two wall racks so you can keep track of things.

Once you have the Heathkit adapter AND cable kits, there'll be no RF job you won't be able to tackle. This part of the job will become so easy you may have to hunt around to find something ELSE to complain about!

Larry Antonuk WB9RRT has written numerous reviews on test equipment and electronics books. He currently works as a project manager for a land mobile service shop in Keene, New Hampshire. He enjoys home-brew projects, experimentation, and instrumentation. Contact him at P.O. Box 452, Marlborough NH 03455.

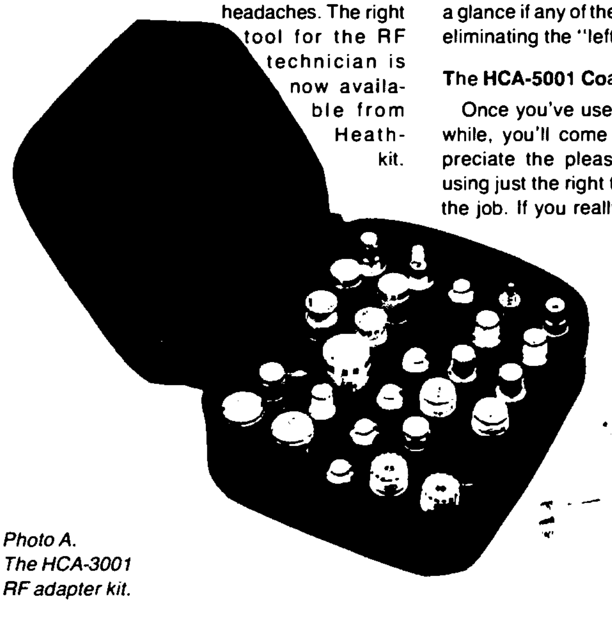

Photo A. The HCA-3001 RF adapter kit.

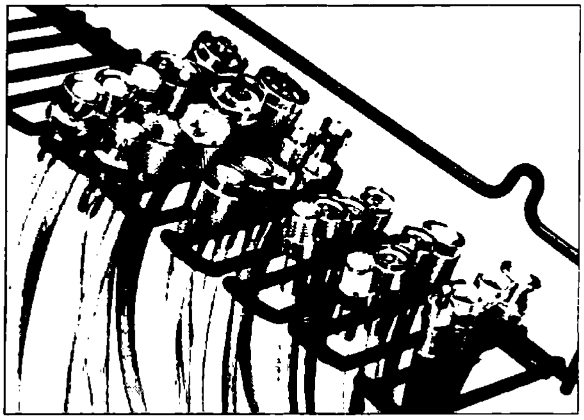

Photo B. The HCA-5001 coax cable kit.

The Worlds of Gus Browning W4BPD

Tribute to a DX pioneer.

by Jack Parker K5CVD

Gus Browning W4BPD, 1908–1990.

Gus Browning W4BPD has become a silent key. To older hams, especially those in love with DX, that call means a lot. It rang through the airways from Maine to Mexico, from the Indian Ocean to the Pacific. Using over a hundred different calls from as many countries, the gentle southern "country boy" opened the door to country after country for the DX fraternity. He left behind friends of every race, color, creed, and social status. He was Elmer to commoners and kings, and one of the truest friends the Amateur Radio Service has ever known. In a word, Gus Browning W4BPD was special.

Gus was born on November 25, 1908 in Elloree, South Carolina, the third child of a poor farm family. His early life was filled with hardship, but as Gus put it, "We were a poor but happy family. No one ever told us we should be unhappy!"

An Early Love

At the age of 16, Gus discovered the magic of radio, and it became a passion that would possess him for the rest of his life. Through the years Gus would travel the world seven times through hundreds of countries, and bring new countries to amateur radio and amateur radio to the world.

Gus's love affair with radio began one afternoon in front of an appliance store in Winter Park, Florida. In the show window stood an RCA Model IIIA radio tuned to KDKA. As Gus described it, the sights and sounds stopped him in his tracks. He had to have one!

The price tag on the radio was far beyond Gus's finances, but he would not be put aside. For the next several months he searched through every *Radio News* he could find. Finally, he found a "pictorial" (schematic) for an L.M. Cockaday two-tube radio. As was the case with his attitude toward poverty and unhappiness, there was no one around to tell Gus how tough a building job he had chosen for himself. With the same persistence that would later take him around the world seven times, Gus began collecting money and parts for his first radio. It took a year of assorted odd jobs, then weeks of wiring and soldering. Finally, the big day arrived. It proved to be one of the saddest days in Gus's life.

First, a couple of important facts. The house Gus and his family lived in was without electricity. The L.M. Cockaday radio was powered by two types of batteries: 1.5 volt A batteries and 45 volt B batteries. In his excitement to fire up his new radio, Gus mixed up the two battery types and applied 45 volts where he should have applied 1.5 volts. Scratch one tube!!! In Gus's words "...they say I cried all that night and the next day over my calamity!"

Gus had no money for another tube, but his aunt came to the rescue and in a short time the new tube was in hand. This time he applied the correct voltages and the sounds of KDKA filled the house with "Dallas." Gus's father said to his wife, "It plays!"

W4BPD at his operating position in 1951. Much of his station was home-brew.

Wrong Code

In 1925 Gus was working for the Lowell Electric Company in Orlando, repairing radios and electrical appliances. He had read about amateur radio and had begun working toward a license. At the same time his oldest sister was trying to get a job with Western Union and found she had to learn Morse code. She and Gus worked together, and within six months they both were copying "...15 or 16 words per minute." His sister Lorena went to Western Union to take the code test, only to discover that she had learned the code on a door buzzer that sounded nothing like the clicks and thumps of a Morse "sounder." She was heartbroken and never attempted to learn the code again.

Gus was also faced with a letdown, as he and his sister had learned American Morse Code, not International Morse Code! But Gus would not be stopped. Two hard years of shortwave listening later, with a lot of help from Clifford Wolking (now W4BNF), Gus passed his license test and became NU4ADB. Gus was on his way.

A Ham at Last

Gus's first transmitter was a push-pull pair of 301A tubes with a filament power of 0.5 amps at 5 volts. Since there was no electricity in his home, Gus scrounged second and third-hand #6 batteries to power his home-brew rig. It was often disconcerting for him to watch five hundred volts drop to fifty volts when the transmitter was keyed. According to Gus, "...working DX was a joke!"

Once again, the Gus Browning tenacity took over. He dipped into his dwindling savings and added another tube to his transmitter and added a counterpoise to his antenna. Time for the acid test. Gus called a D4 (Germany, at that time) and nearly "fell out of the chair" when his 5-watt signal was answered. Gus was hooked on DX. His new passion would be the main driving force throughout the rest of his life.

The continuing cost of batteries and the lack of work in the Orlando area soon drove Gus to seek a better life. At the invitation of his older brother, Gus moved to Philadelphia, Pennsylvania, where he got a job with the Philco Radio Corporation. His call changed to NU3BBH and later became W3BBH. Over the next several years Gus worked and played at radio in Philadelphia, and met and married his wife (Agnes) Peggy Smith. Life was almost as good as it could get.


W4BPD's operating position, circa 1955.

Becoming His Own Person

Gus had always detested having to deal with a time clock. He dreamed often of the day when he would no longer be tied to someone else's idea of the right time to work or play. When unionization came to the Philco plant, it was soon followed by a strike that left Gus out of work. He seized the opportunity to get away from the big city and relocate to Orangeburg, South Carolina, and the gentle rolling hills he had left many years before as a child. His new call was W4BPD—a call that was to become known worldwide.

The first four years in Orangeburg, Gus worked for an electric company, repairing everything from fans and fences (electrical, of course) to radios. Then he had the opportunity to open his own radio and appliance repair business, and he did. No one ever again told him when to work and when to play.

Throughout Gus's years as an amateur radio operator, DX was his passion. He worked at it continually and joyously, but there was something missing. Gus's wife Peggy told it best in the January 28, 1970 issue of Gus's *The DXERS Magazine*:

"After many of his DX contacts, Gus would try to tell me about what these DX QSOs were like. He would even try to tell me how he thought things and scenery would be to these DX hams when they walked out of their front doors. He would get a sort-of-DX-gleam in his eyes...and the more DX he worked, the deeper this gleam would get. He said one morning (after he had been up since 5 a.m. working DX), 'One of these days I am going to be DX and see some of these rare spots.' 'Yes,' I would answer, 'and I am going to fly to the moon . . .' "

Going DX

World War II came along and took amateurs off the air. When the word came allowing amateurs to resume their hobby, Gus was ready. Within 90 days, he worked over 100 countries, and won DXCC certificate #4 from the ARRL. He continued to chase DX for 14 years before his wish/dream finally became possible.

Gus Browning did indeed become DX! For ten or more years he traveled the world on one DXpedition after another. He circled the world seven times, and (according to Gus) was in every country in Africa at least three times. He signed over a hundred different callsigns all over the globe. He was Elmer to kings and a friend to amateurs everywhere he went.

Gus's first trip abroad was financed out of his own pocket. In Gus's words: "After chasing DX for 14 years I finally sold a small tract of timber I had on that 152 acre farm for $3750.00, and that's when I said, 'I am going on a DXpedition!' "

Gus's destination on that first trip was the Seychelles Islands in the Indian Ocean. In later years he described the Seychelles as his idea of paradise, and he returned there many times. Throughout his travels the Seychelles remained his favorite place.

A Magazine for DXers

Aside from the many new countries Gus made available to DXers worldwide, Gus made a much greater contribution to the DX fraternity. Following his 1966 DXpedition, he started his own magazine dedicated to informing DXers of rare countries and DXpeditions. *The DXERS Magazine* published over 500 weekly issues in its time, and for Gus was another new adventure. He tells it this way in the December 24, 1969 edition:

"Upon returning from my 1966 DXpedtion, I were [Gus never learned to conjugate the verb "to be"] asked by a number of DXERS to take on the task of putting out a magazine strictly for DXERS since I been on both ends of DX and should know a little bit more about the game than the average ham. Having been a DXER since 1927 certainly qualified me from the angle of the USA DXER. But having not been trained to write what I had learned and not knowing anything at all about printing I had my doubts if I could successfully put out a magazine that the boys would subscribe to."

But Gus did put out a magazine, and it was well read. In each issue, he wrote a column that he eventually called "Straight from the Horses Mouth," (with his own brand of spelling) filled with tales of his life, his travels, and his philosophy. From mimeograph to offset, from stumbling to running, Gus kept his friends around the world informed. When he was traveling the world, his wife Peggy, daughter Joann, and son Gus, Jr. ran the show, keeping everyone posted on Gus's adventures to date and plans for the future. While it was never elegant, it was always informative and ALWAYS fun!

Gus Browning was a pioneer. His life can best be summed up in the philosophy he lived by: "We were happy, 'cause nobody told us we shouldn't be!" He was successful as a DXER because no one told him he couldn't be. He was successful as a publisher (in his own special down-home way) because no one told him he couldn't be. His contribution to the hobby was considerable. We shall miss him.

You may reach Jack Parker K5CVD at PO Box 356, New Ellenton SC 29809-0356.


Gus and Peggy Browning. Photo by Skip WB8OWM.

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
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Houston TX 77083

Hamsat Antennas

Orthogonal, or mutually perpendicular, antennas are commonly used for satellite communications. The crossed yagis of Cushcraft, Telex/Hy-Gain and KLM are good examples of commercially available yagis providing linear or circular polarization, depending on the harness configuration.

Our VHF/UHF satellites like AMSAT-OSCAR 10, AMSAT-OSCAR 13, Fuji-OSCAR 20 and the Microsats all transmit their downlink signals using circular polarization. Simply buying a commercial antenna with a polarization switcher will provide the appropriate equipment for receiving satellite signals—at a price.

The basic Telex/Hy-Gain system, the 218S, goes for $300. It includes antennas for 2 meters and 70 cm, has stainless-steel hardware, and incorporates polarization switchers for each band and a Fiberglas™ boom for mounting through an elevation rotator. This represents the most cost-effective system for performance versus price, though adding rotators for moving the array in both azimuth and elevation makes it pricey.

The Cushcraft satellite antennas are cheaper, until the polarization switchers are added, while the KLM system is the most expensive. It is possible to have as much as $1,000 tied up in a satellite antenna system after the coax, connectors and rotators are added. A viable alternative is to build the antennas, keep the feedline short, and use inexpensive "TV" rotators or second-hand ones from a swapfest.

Building Antennas

Hamsat antenna construction projects can be found in *The Satellite Experimenter's Handbook* by Martin Davidoff K2UBC. They range from simple turnstiles to more exotic helix types. This book also discusses the use of crossed yagis and parabolic dish antennas.

The *1990 ARRL Handbook* discusses system configurations in the "Space Communications" section and presents some good VHF and UHF designs in the "Antenna Projects" chapter. Back issues of *73* are also excellent sources. The May 1989 issue presented a "Home-Brew 435 MHz Crossed Yagi" by Keith Berglund WB5ZDP and Doug Howard KG5OA. This issue also had articles on 1.2 GHz systems, polarization/matching circuits, mode "S" (2.4 GHz) receive techniques and "AANother Turnstile Antenna" by Henry Falkner ZL1AAN.

Many of the construction articles found in books and magazines prefer yagis for 2 meter and 70 cm operation. When two yagis are positioned in a mutually perpendicular fashion to form an "X," and are fed properly, a circular or linear polarization can be achieved.

The Cushcraft 2 meter "twist" represents the simplest form, with both yagis on the same boom and without physical staggering of the elements. The orthogonal driven elements are separated only by the physical constraints of the hardware, as are all of the other elements including the reflector and the directors.

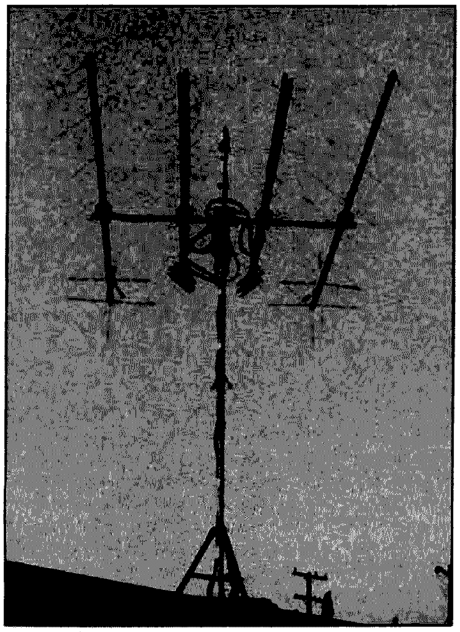

Photo A. Orthogonal quagi antenna array at N6JJI. (N6JJI photo.)

Linear polarization is achieved simply by connecting the driven elements together through a power divider composed of 75 ohm matching sections of coax. To get circular polarization, a quarter-wave piece of 50 ohm coax is placed in line with one of the two yagis before the matching section. Instructions with the antenna show the location for the 50 ohm delay line, depending on whether you want left-hand or right-hand circularity.

Other manufacturers and some construction articles use staggered elements where the orthogonal yagis are physically shifted with respect to each other along the length of the boom.

The yagi in one plane is positioned a quarter wave ahead or behind the other. When the two are fed with a power divider, the effect is a circular pattern, thanks to the physical shift of the antennas along the boom. To get the opposite circularity, a half-wave delay line is switched into one feedline before the divider.

Orthogonal Quagis

Quads and quagis are three-dimensional so they cannot be used on the same boom for orthogonal systems, although some interesting experiments with staggered element positioning might be possible. It is much easier to mount two quads or yagis with mutually perpendicular positioning on a cross boom with some distance between them, typically one wavelength. A good satellite antenna system can be constructed using a delay line and matching network with a polarization switcher.

In the September/October 1983 issue of *Orbit* from the Radio Amateur Satellite Corporation (AMSAT), Martin K2UBC presented some interesting findings about circularity and A-O-10 operation. The article "Off-Axis Circular Polarization of Two Orthogonal Linearly Polarized Antennas" showed that since the 2 meter and 70 cm antennas on A-O-10 (and A-O-13) are part of a phased array with separation on the order of a wavelength, ground stations can experience apparent polarization shifts whenever the satellite is not "aimed" directly at the user. For those stations using physically-separated, mutually-perpendicular gain antennas, the effects of these shifts can be minimized or eliminated via slight off-pointing.

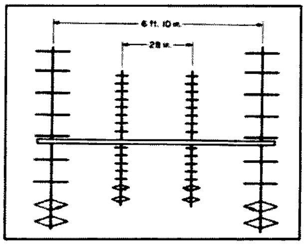

Figure 1. Orthogonal quagis—top view.

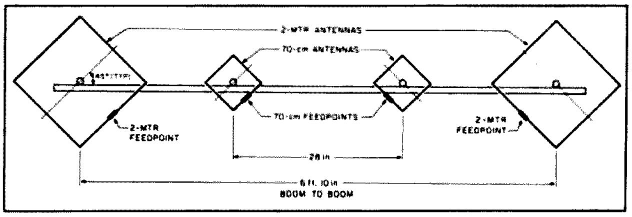

Figure 2. Orthogonal quagis—rear view.

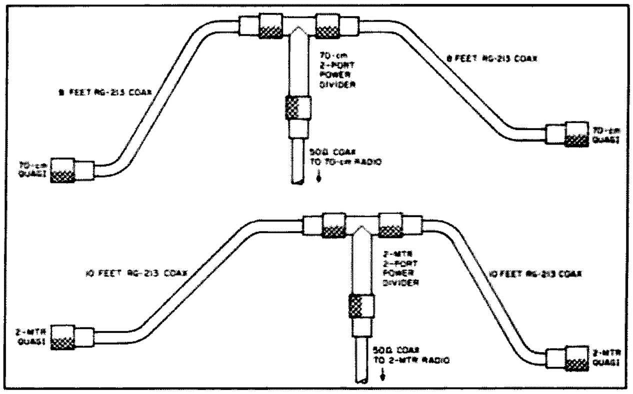

Figure 3. Quagi feed system.

The off-pointing polarization shift is caused by the physical difference in distance to the satellite between one yagi, quad or quagi with respect to its orthogonal counterpart.

If four antennas are placed on the same boom as shown in Figure 1 (two for 2 meters and two for 70 cm), fed by equal lengths of coax as shown in Figure 3, they will exhibit linear polarization directly in line with the array. When they are aimed 14.5 degrees either to the right or left of center, the effect is circular polarization, left-handed or right-handed respectively, in line with the distant observing station or satellite.

Photo A shows the orthogonal quagi array at the home of Alex N6JJI. The August 1989 "Hamsats" column featured Alex's dual-band corner reflector for satellite operation. His quagi array provides circular polarization using the method of off-pointing described above. The quagis are generic types described in *The ARRL Handbook* from at least 1979 through 1989. The 1990 *ARRL Handbook* did not reprint this popular design. Using antennas with moderate gain and wide beamwidth, the off-pointing method of circularity switching can more than compensate for the gain pattern rolloff.

Physically-separated, linearly-fed orthogonal antennas are simple in de-

Continued on page 60

Number 21 on your Feedback card

Hams Around the World

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A51JS: The Kingdom of Bhutan

Adapted from a DXpedition report by Jim Smith VK9NS/A51JS. When I stepped on the plane at Norfolk Island that Sunday, it was hard to believe that my destination was the Kingdom of Bhutan. The very name of this remote and isolated country conjured up all sorts of images. The little that I had read seemed to indicate a move on the part of the country into the 20th century. H. M. Jigme Wangchuck, ruler of the land of Druk (the thunder dragon), has steadily moved his country forward, on many occasions embracing Western technology. Yet, magically, so far he has been able to keep the country's culture intact. Tourist entries are kept to a minimum so the visitor witnesses real life rather than the tourist-oriented hype found in so many places.

A few years ago you had to enter Bhutan via India, through the southern foothills of the Himalayas. Many hours of travel later, via a winding, climbing thread of a road clinging to the edge of the mountains, the traveler arrived at Thimphu. The road started off at a tropical 500 feet above sea level, then rose to just over 7,500 feet in Thimphu, the capital. Thimphu nestles in a valley more or less surrounded by high mountains on all sides.

My journey was to be much easier: Norfolk Island, Auckland, Bangkok, then Dhaka in Bangladesh, and finally Paro in Bhutan. It was only a couple of weeks previously that I had received the telex which said in part: "Permission is granted to enter Bhutan as a common tourist, amateur radio permission will be granted on arrival, subject to checks of radio equipment." Thus, in over three years of communication and contact with the government of Bhutan, a germ of an idea had come to fruition.

The Route to Bhutan

It was a mad rush to get things organized, and several things did not gel. Several promised items from Japan and the U.S. simply did not arrive, due to air freight difficulties on the Bangkok-Bhutan leg. As a result, there was no beam, no additional coax (for other antennas), no 6 meter rig, and so on. However, I left Norfolk Island with two rigs, an ICOM 740 and an ICOM 751 (JA version), 30 meters of coax and a Butternut HF6V vertical antenna.

However, I carried a great deal more. On check-in at Norfolk Island, I was carrying 70 kilograms of excess baggage. I usually have several items of baggage and I invariably carry a rig on board as cabin baggage.

It was later in Auckland that I had my first shock. A change of airline schedule had me leaving on Thai Airways for Bangkok, several hours earlier than planned. As I checked into the Thai counter, the girl was quick to point out that my baggage was overweight. And, she wasn't too happy about the 12 kilograms of cabin baggage, either. Ten minutes later I was spending US$750 on excess baggage, despite her slashing almost 30 kilograms off my official weight and closing her eyes to my "cabin baggage." A charge for 30 kilograms at US$25 per kilo was disillusionment indeed.

Several hours later we landed at Bangkok Airport. I have nothing but praise for the facilities there. I approached Customs with caution but, with just a moment's explanation, I was waved through with a smile. A few minutes later, with real Thai currency in my pocket, I was in a taxi on the way to the hotel in town. With three nights in Bangkok, I spent Monday and Tuesday trying to locate the freight that I was sure was waiting for the flight to Bhutan. I also had to organize my entry visa. Some US$690 later I had my round-trip ticket to Bhutan. I was ready for the flight due to leave on Wednesday morning.

They meant MORNING! With check-in time at 0630, and an hour's drive from town to the airport, I was up at the crack of dawn. I was really worried about the excess baggage, with visions of much of it being off-loaded, but check-in at the Druk Airline counter was uneventful. The check-in girl was delightful, hardly batting an eyelid as my main items were handed over. Then she spotted my cabin baggage. "Perhaps it would be more comfortable if it was loaded with the rest," she suggested. Not a murmur as the scales went up another 12 kilograms. After a very token charge of US$200 I was breathing freely again.

Finally, Paro

The approach to Paro seems to be a real test of pilot skill (not to mention passenger nerve) as the plane lets down, winding and twisting through the mountain valleys. Finally we were on the ground and disembarking at the airport in the fertile Paro valley, 6,500 feet above sea level.

I had declared almost $4,000 worth of amateur radio equipment, so I was concerned! However, I soon spotted Sherab Dorji of the Wireless Division. After our formal introduction he took my customs declaration form. Each item was passed by customs as it was collected, and we were soon outside the airport. Over lunch I learned that I would be given permission to operate amateur radio and that Thimphu, our actual destination, was a couple of hours drive away.

The journey to Thimphu was my introduction to the winding, climbing roads of Bhutan. The sealed road was in excellent condition and, as we climbed higher and higher out of Paro, the views were tremendous.

By the time I had checked into the Hotel Motithang and all my baggage was safely unloaded, it was late afternoon. We all sat around relaxing and talking, and we decided to look at the radio equipment in more detail. With several willing helpers we soon had the main items unpacked. A look out of the hotel room window (on the ground floor) showed that getting the Butternut vertical organized would be easy. Indeed, with the help of Sherab and others, the antenna was assembled and erected within 30 minutes (I have it color coded for quick assembly). There was one slight hiccup—my multi-point extension cord would not fit into the hotel power point. A quick fix involving matches and stripped cable ends made power available. The next day, after a quick trip to the local electrical shop, I had a safe power connection to the hotel power outlet.

A51JS QSO Breakdown

Band	CW	SSB
10m	1,682	1,607
15m	2,105	2,537
20m	3,056	2,767
40m	828	10
80m	98	
Subtotal:	7,769	6,921
RTTY		182
Total:		14,872

We switched on the IC-751 and, after a few minutes of quick demonstration of the main controls and a discussion about power output and frequencies, I had the go-ahead. A "CO" call was answered at 1143 UTC on 21st March and, after an eight-year lapse, the Kingdom of Bhutan was once again active on the amateur bands—A51JS was in QSO with YB5BZ on 20 meter CW on 14020 kHz. This statement does not really do justice to the actual situation or truly reflect the tremendous trust and genuine interest on behalf of the Wireless Division of the Royal Government of Bhutan. Eight years is a long time in amateur radio terms. It means, for example, that thousands of hams have never heard Pradhan A51PN who, for over four years, in the late '70s, had been the sole "voice" of Bhutan.

Sherab Dorji of the Wireless Division mentally copied this first QSO and the subsequent ones. He was smiling broadly. Was he also glad that amateur radio was on its way again? I like to think so. The eruption on the band increased as more and more people realized that they were listening to activity from Bhutan. Just over an hour later I picked up Kan JA1BK on CW, a quick QSY to SSB. This was the first A51 SSB phone QSO in over eight years. Kan also telephoned Kirsti VK9NL, Jim's XYL, and a day earlier than expected we were in QSO. Shortly after that there was a break for an hour or so. Sherab and others had to leave but we arranged an appointment for the next morning to finalize permission. Then I would get an official letter of authorization. In the meantime, if I wished to continue to operate, that was agreeable.

Over the coming days and weeks I grew to respect the Bhutanese people more and more. They have to be one of the most open and honest people in the world. Sherab and others were determined about one thing: I had to be shown something of Bhutan. I was not going to sit in front of the rig day after day; there were things to see and do. As a result, I did four main things during my stay: I slept, I operated amateur radio, I became a tourist (without really realizing it), and I discussed amateur radio at length—amateur radio regulations, frequency allocation, power, band planning, and so on.

Operating From Bhutan

In the early days there was some frustration. I found it quite cold and sometimes uncomfortable, and there were many power cuts. Sometimes the power cuts lasted only a few minutes, sometimes an hour, and sometimes longer. It seems to me that on occasions Murphy picked the most inconvenient times, usually late afternoon as the band was opening up to the US, often in the middle of my sked with Kirsti. Propagation openings, especially to the different areas of the US, were very short. I used the DX Edge and it was just like working on 80 meters. Gradually, though, the QSO rose and more East Coast, West Coast, South America, Europe, and so on were logged. Of course I worked many JA stations as they were almost always in skip.

The HF6V was at 7,500 feet. However, the hotel was tucked up at the end of a valley with mountains all around. Often the incoming signals (in particular those from North America) were almost unreadable, due to flutter. I put this down to polar effects, but I also think that there were many multi-path reflections because of the surrounding mountains. Many US amateurs have also commented that there were wide variations of beam headings for the A51JS signals.

Quite often my power output was around 80 watts key down on CW. It

Continued on page 68

ASK KABOOM

The Tech Answer Man

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More Stage-by-Stage Hunting

Let's continue last month's discussion on how to recognize circuit stages. Here goes:

Transmit drivers: These are usually made from transistors, although they may be ICs in walkies and some VHF/UHF mobiles. There may be several stages, with the last one leading to the final amplifier. Look for coils. In HF rigs, they may connect to the bandswitch or band switching relays, and the coils will most likely be found there. In VHF/UHF equipment, the coils are often just a few turns of wire, perhaps ¼" to ½" in diameter, with no core. Look also for trimmer capacitors. The driver transistor just before the final amp will probably have a heat sink, or it may be bolted to the chassis. Also, the predriver, which feeds the driver, may or may not have a heat sink.

More Stages

VFO: This is an oscillator, whether digital or analog. The analog variety is simple. Look for a big air-gap tuning capacitor. A few HF rigs use "permeability-tuned" oscillators. This is just a fancy way of saying that to vary the frequency, they move a core in and out of a coil, instead of using a variable cap.

Above HF, there are very few non-synthesized VFOs. There is either a crystal oscillator or, in rare instances, a varactor diode tuning arrangement. The varactor looks like a combination diode/capacitor on a schematic, but it functions like a voltage-controlled capacitor, and actually has no diode-like properties. It simply changes capacitance when the DC voltage on it varies, so you can tune with a pot instead of a cap.

The digital variety is quite a bit more complex. It usually involves an analog varactor-tuned oscillator driven by a messy digital system. Basically, the digital stuff examines the frequency of the oscillator and, using a DC control voltage, shifts it until it matches a square wave generated by the digital circuitry and referenced to a crystal. In this way, the analog oscillator can be set to many different frequencies, yet have the long-term stability of the crystal. In other words, no drift.

Some new HF synthesizers use a direct sine wave synthesis scheme, avoiding the analog oscillator altogether. Instead, they construct a sine wave from digital steps and then filter it, just like a CD player reconstructs music. In radio gear, this technique is called direct digital synthesis, and I expect it to become more and more common.

Regardless of its construction, what you are looking for is a sine wave signal at the output of the VFO. With the exception of a direct digital synthesis circuit, lack of output means the analog oscillator is not working. Even in a synthesizer, the oscillator should still run, regardless of the state of the digital system. It may, however, be way off frequency if the synthesizer is broken.

Check the output with a scope. It should be a few volts peak-to-peak, or more. If it is missing altogether, check the transistor or FET, which is directly connected to the tuning cap or variable coil. If there's power but no signal, the transistor is probably bad. If the signal is there, check the buffer transistor which follows the oscillator. Often times, that's the one that dies, because it has to handle more power.

Whatever you do, resist the temptation to turn trimmers or adjust coils. If the oscillator is dead, it is almost certainly *broken*, not out of adjustment! Once you mess with those settings, you will be sorry later, I promise.

Local oscillators: These are just about always crystal-controlled. Like VFOs, they should have a few volts peak-to-peak or more at their outputs. If not, check the transistor connected to the crystal. If it is good, suspect the crystal itself. Especially in older rigs, the rocks seem to fail in a random fashion. Also, if the oscillator is dead but can be brought to life by tapping on the board, check for cold solder joints. If there are none, the crystal is the likely culprit. The same holds true for any oscillator that comes and goes by itself, again, as long as there are no cold joints.

Receiver front ends: Their job is to amplify and bandpass-filter the incoming signals and send them to the mixer. They deal with extremely weak signals, and cold solder joints can really mess things up. Always look for them first. Then, work backward from the mixer, using a signal injector.

The safest way is to use a signal generator fed through a discharged 100 pF cap. You can make one from any astable flip-flop or timer. The square wave output will have plenty of harmonics and should be audible at least through HF, perhaps higher.

I suggest signal injection because looking for incident signals with a scope is likely to be fruitless. The signals are too small and there may be many of them at once, causing the display to appear to be nothing more than low-level noise. It can be very hard to tell whether the stage is working or not. Injecting your own signal just makes it a whole lot easier.

Mixers: These have two inputs and one output. One input comes from the front end (or mike amp, in the case of a transmitter) and the other comes from the local oscillator. Many apparent mixer failures are caused by a missing input! If they're both there, check the output, which should lead directly to the first IF or transmit filter. In the case of a diode-ring mixer, which looks like a bridge rectifier, one diode could be bad. An IC mixer either works or it doesn't. A balanced-transistor arrangement could have a bad transistor.

The easiest way to tell is to check and/or change them, one at a time. Be sure, though, to mark which goes where. In a balanced circuit, putting them back in each other's places could cause circuit unbalance and require realignment. If you do replace parts, you'll probably have to rebalance the circuit anyway.

IFs: These are basically bandpass amplifiers. That is, they amplify only the frequencies within their bandwidth and attenuate all others. Usually, failure means complete, or nearly complete, loss of signal. When tuned to a station, you should be able to see a signal at the IF frequency which gets bigger at the output of each stage. The output, by the way, will be where the transistor collector meets the IF coil. If the stages are made from ICs, check where a lead from the chip meets the coil.

It is very important to note that the IF stages are gain-controlled from the AGC amp. If the AGC voltage, which is a varying DC level, should go way off, the IFs can look dead or weak, even though they are just "obeying orders." If, on the other hand, there is too much IF gain, the AGC is the first place to look. It's highly unlikely that an IF stage has started to work too well! If all the stages and the AGC amps seem OK, but there's still no output going to the detector, check the ceramic, crystal or mechanical filter. It should be fairly large in HF rigs, but may be small in VHF or UHF sets.

If it has input but no output, try jumping across it with a 0.1 µF cap. If you get a good signal, you've found the problem. If there's still no output, try removing the filter and jumping the connection again. If that does it, the filter may be shorted to ground. Note that it is normal for the signal coming out of the filter to be significantly smaller than what went in. If jumping it only brings things up slightly, you're looking in the wrong place.

FM rigs deliberately drive the IF stages to saturation. This technique is called "clipping," or "limiting," and the purpose is to remove any amplitude variations from the signal. Along with the AM components go noise spikes and most other interference. It is this vital characteristic which gives FM its nearly noise-free performance. It is also the reason for the loud "whoosh" sound you get with an open squelch on a blank frequency. You can use this to great advantage in a repair job. If you get the loud whoosh, the problem is most likely in the front end, not the IF. If all you hear is audio amp hiss, with no whoosh, the IF is the place to look.

AGC amps: These control the IF and/or front end gain. They work by varying the gain of one or more stages with a voltage derived from the signal strength of the tuned station. The signal is usually picked off near the last IF, after the filter. That way, signals outside the filter's bandpass won't clamp the receiver gain down. In some rigs, the AGC is derived from the audio after detection. This is considered an inferior technique, found mostly in older rigs and QRP equipment.

The AGC amps drive the S-meter, pushing the S-unit reading up as they clamp the gain down. This makes the meter a valuable instrument. If it is pegged and the rig is silent, check for a shorted AGC transistor. If it is at S-0 and the rig is silent, at least you can be pretty sure that the AGC isn't clamping off the IFs. If the receiver sounds overdriven and distorted, but the needle doesn't move, the AGC amps aren't doing their job.

Trace back from where the first amp gets its signal, and try to find the point at which it is applied to a cap to change it to varying DC. There will probably be a diode feeding this cap. If there's no voltage on the cap, you're close to the problem.

Well, there's plenty more to go in this discussion, so we'll save the rest for next month. You may notice that I've concentrated on receiver troubleshooting, and hardly mentioned transmitters. Many stages are common to receive and transmit, and most signal problems will affect both. It's simply easier to fix a rig set for receive than for transmit. It's also safer. If the problem affects only transmit, that's a good clue because it instantly eliminates from consideration all circuitry shared with the receiver. The same troubleshooting techniques apply, and the signal paths are much the same.

With a transmitter, of course, the start of the process is the mike and mike amp, instead of the front end. And, of course, the end of the process is the final amp and antenna instead of the speaker. Other than that, there really isn't much difference. Both use mixers and IF stages of some kind, although in transmitters they may not be called IFs and they may have fewer stages.

Dear Kaboom,

Here in my apartment building in Spain, my HF receiver is getting wiped out by a 5 kHz wide signal appearing every 14 or 15 kHz, all over my dial. I suspect that it is from the horizontal oscillators of nearby TV sets. My receiver is a nice old Drake and I don't want to trade it in. How can I filter this mess out?

Gettin' Buzzed

Dear Buzzed,

First the good news: You don't have to trade your rig in. Now the bad news: It wouldn't help if you did! You're right—this noise is undoubtedly coming from your neighbors' TVs. Unfortunately, it is really there, on your receiving frequency, and there is no way for your rig, or any rig, to tell the difference between the hash and the signals you want to hear. It is not of an impulse nature, so a noise blanker won't help.

It's conceivable that some of it could be coming through the power line, so trying a line filter might not be a bad idea. Most of it, though, is probably coming right through your antenna. I doubt if you can get rid of it, but a different antenna may help cut it down a bit. In particular, stay away from end-fed, unbalanced antennas. Try a dipole with a balun, or better yet, try a beam.

There are exotic approaches, such as using a separate sense antenna and subtracting the noise, as is done for VLF loop antenna setups. It is likely, however, that you'll just have to live with it. Who said TVI is always our fault?

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS /Hamhelp SIG. (2400 baud, 8 data bits, no parity, 1 stop bit. (603) 525–4438). Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters 1 or i, or even the number 7. Thank you for your cooperation.

I need info on how to build, or where to buy, an SCPC Receiver with AFC and an accurate digital readout for around $100. *L. Epperson, 105 Hollywood Dr., Glen Burnie MD 21060.*

I need a manual for an Atlas 350-XL Transceiver. *Robert Rice, PO Box 53798, Houston TX 77052-3798.*

Blind, handicapped young man, a shut-in, would like to hear from people and seeks someone to donate a portable or table size shortwave radio receiver. Phone *(213) 938–5347* or write, he welcomes letters. *Richard Jartrow, 5909 West 6th St., Los Angeles, Calif. 90036.*

I need information or a schematic/operating manual for the Knight TR-108 (2 meter) Transceiver. *Dorian Blasdell N7PCT, 113 Wilmar Ave., Grants Pass OR 97527.*

Wanted: Schematic and manual for Hallicrafters S-38C Receiver. I will pay for copying and airmail postage. *David K. Hanson c/o Saudia, PO Box 167, Cost Center 956, Jeddah 21231, Saudi Arabia.*

Wanted: Copy of the manual for the Hallicrafters SR-46A six meter AM Transceiver, plus any information on the matching VFO. Will pay all expenses. Leave your message at (508) 347–5316. Thanks and 73. *Dennis Kosakowski N1FXG, 52 Ridge Way, Sturbridge MA 01566.*

HAMS WITH CLASS

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Just Do It!

Every time someone gets an idea to try to implement something new or innovative, someone else will inevitably be there to give them all the reasons why it will never work, can't be done, shouldn't be done, and why they shouldn't waste their time trying. It's amazing how many people, who generally do nothing themselves, are always on the sidelines to make sure no one else tries to do anything, either.

It's a sad commentary that most accomplished people in history had to call upon their own inner resources to persevere over the objections, ridicule, and negativism of others. What is it these "others" are afraid of—that you will succeed? Perhaps it's that they are so afraid of failure themselves that they don't want anyone else showing them up. What's wrong with failure, anyway? That's how we grow and develop our strengths and skills, and move on to our best successes.

At the beginning of every school term, I hang up a sign in our classroom ham shack that says, "Just Do It." Before I begin doing anything at all in my classes, I set the tone and attitude for the whole school year. We're going to follow the rules and standards we set down at the beginning, and we're also going to try new things, to explore and to experiment.

One of the key ingredients in a successfully run school program is a motivated, enthusiastic instructor. How excited can you be if you're doing the same old stuff over and over again? The beauty of amateur radio in a classroom is the wide variety of new experiences you, as an instructor, can enjoy if you're flexible enough and willing to try new things.

Getting Ready to Do It

I stress the value of preparation as a first step with my classes. We discuss the need to think through new ideas and to carefully evaluate project suggestions. The next step is to prepare the best that we can to implement our goals. If it works—great! If it doesn't work—that's all right, too. We can always gain something from a well-thought-out effort. In my class, it's the dedicated attempt that counts almost as much as the success. Not trying for fear of failure is the cardinal sin.

Over the years, many of the youngsters have confided in me that they were afraid to take the license exam for fear of failing it. I always try to make the kids understand that it's the effort that goes into something that really counts. If you don't pass an important test the first time, learn where your weak points are and try to master them. If you want something badly enough in life, you must be willing to keep on trying to knock down obstacles until you get it. Never allow yourself to become paralyzed because of that terrible word "failure." Just do it!

It's always easier to make a case for why you shouldn't try something new or difficult. It's simply less bothersome not to disturb the status quo, not to rock the boat, not to make waves. Notice all the idioms and caveats we have in our language to encourage the idea of doing nothing. We'd still be writing with quill pens by candlelight if it weren't for the achievers among us who *just did it!*

Beginnings of "Introduction..."

Nine years ago I met with this kind of negativism when I decided to try implementing a program called "Introduction to Amateur Radio" in a New York City intermediate school. Almost everyone around me assured me it would never work and that I was banging my head against a stone wall. Even if I did somehow manage to get it through the incredible beauracracy of the New York City Board of Education and convince a principal to let me try it, who would support it? And how would I keep the kids interested in something so technical?

I've never really been sure where stubbornness ends and determination kicks in. In either case, I prepared, and began to gather the resources I needed to implement my plan. It wasn't easy by any means, but tell me about something really worthwhile that was ever easily attained. As I look back over the past nine years, I realize all the things that could have gone wrong, or could have happened differently, but didn't.

The amateur radio program is one of the most popular classes in our school today, with close to 800 highly motivated youngsters coming through it each year. For all the negative and pessimistic people, there were enough supportive and encouraging people, like Stanley Katzman, Principal, and ham friends like Vince K2VJ, Ed KA2TXL, Roger W2SLP, Hip N2FDJ, Steve WA2DHF, Art K2BSJ, Walt W2ELM, and Bro. Joe AC1U. These were the folks who were there for me at the beginning, *before* the course was a success. I will always be grateful.

My advice is to surround yourself with people who believe in you and who will help you with your dreams and goals. Try to get good people to work with you. Networking with creative, talented, cooperative people is the real spirit of amateur radio, isn't it? A well-prepared attempt at something you believe in is what builds character and stops us all from stagnating as individuals and as a society.

This very strong philosophy of mine is what I was thinking about the other day as I mentally reviewed how much amateur radio had helped change the lives and directions of many of my students who had risen to the challenge.

Mary KB2IGG Speaks Out

One of the youngsters who wasn't afraid to fail is Mary Alestra KB2IGG. A shy, soft-spoken 6th grader when she first entered my ham radio class last year, she went on to become the Westlink 1990 Young Ham of the Year. I sensed something special about Mary right from the start. There was a drive and a determination along with a real love for what she was learning. With over 9000 young people having gone through my program, a youngster has to be really special to impress me. Mary is such a youngster. She impresses me daily with the way she handles herself as a student, as a radio operator, and as a young lady.

Carole Perry WB2MGP, Mary KB2IGY, and Mary KB2IGG, award winner, are on the classroom rig every morning.

Mary studied hard to get her Novice ticket last year, and even had to take the code part twice. She was very hard *on herself*, and doesn't like to accept failure. With lots of encouragement from her parents and teacher, and an incredible self-determination, Mary went on to get her Advanced license, and is now studying for her Extra. Mary has gone from a shy, studious girl to a confident, poised, and somewhat extraverted 12-year-old right before my eyes.

At the ARRL National Convention in Kansas City, Missouri, this past June, Mary brought the audience to their feet with a standing ovation for her acceptance speech as the 1990 Young Ham. I think that if we work hard at it, and we're really lucky, Mary may be representative of the future of amateur radio. Here is an excerpt from the acceptance speech of this incredible youngster who just did it!

"Amateur radio has played a big part in my life ever since June of last year. It was then that I was first introduced to the hobby, at Intermediate School 72 in Staten Island, New York. I was very interested in Morse code, a new and challenging language, and truly enjoyed operating voice around the world from our school's ham shack. After seeing and experiencing how much fun ham radio can be, and realizing the tremendous benefits to be gained from being a ham, I studied on my own, received my Novice ticket and set up my own shack soon after.

"Since then, ham radio has proved invaluable to me in my school subjects. I find that I have progressed in my geography and science skills, as well as in math and language arts. Listening to the dialects of those many foreign hams has no doubt aided me in my foreign language studies.

"I've made many new friends through ham radio, adults as well as children. We often become pen pals and exchange pictures and other articles. We always find it interesting to get the inside report on events happening in their part of the country and how they are affected by it.

"Through ham radio, I have become more aware of current events throughout the world, and how big a part we as hams play in emergencies and disasters, as well as in local events, and how valuable we are to our communities. I, myself, have provided communications back to school on grade and class trips to other cities and amusement parks.

"Ham radio has so much to offer, and so many benefits and privileges to enjoy. Whether it be rag-chewing with the local hams, DXing overseas, packet, or code, everyone enjoys and benefits from at least one aspect of our hobby. The really great thing about it all is that what you learn now can certainly be applied in the future when trying out for that school you'd always wanted to go to, or that job you'd dreamed of getting. I myself plan to pursue a career in communications, and I truly feel that ham radio will help me carry out those plans in years to come.

"I really can't express how proud I am to receive this award tonight, but I do hope that in my receiving it, I will encourage other young people to get started in this most worthwhile hobby and service, and to succeed in its many aspects. The most important thing is not the fancy equipment or the 70-foot tower, which I can tell you from experience isn't necessary. Running 25 watts into a 54-inch portable antenna, I have contacted Russia, various parts of South America, Puerto Rico, maritime mobile stations in the Gulf of Mexico, and many local hams as well. What really counts is the effort you put into it and the motivation you give yourself. If you really want to be a ham, in time you will be, and you will enjoy the many privileges being a ham has to offer. I *hope that other* children *will* realize that the time and effort put into ham radio will be well rewarded, and the pride gained from being a ham will last forever." 73

73 Review *by David Love NU3T*

The CELJACK™

Connect land line telephone equipment to your cellular phone.

Telular Inc.
1215 Washington Ave.
Wilmette IL 60091-2566
(708) 256–8000
Suggested List Price: $480

What do you do when your repeater is located where there are no phone lines and you don't want to fool around with full-duplex phone links? That was the dilemma facing the Blue Knob Repeater Association when they erected their UHF machine. An autopatch isn't a necessity on a repeater, but it sure is a nice feature.

The association's secretary had noticed an advertisement in a trade magazine for CELJACK, a device that interfaces to a cellular telephone and provides a standard RJ11C phone jack for direct connection to a telephone. The CELJACK takes care of loading the number delivered to it via either dial pulse or DTMF tones into the cellular telephone and, in essence, tells the phone that the SEND key has been depressed. At the end of a call, when the controller puts the CELJACK back on hook, the interface tells the cellular telephone that the END key has been pressed and the call is terminated. In addition, the regular cellular telephone handset is still connected at the site, so we would have a telephone available when we go to the site to work on the repeater.

We were fortunate enough to have two cellular telephones, donated by members, for use by the association. After checking with Advanced Computer Controls for information about interfacing with the ACC RC96 and 850 controllers, we decided to try a CELJACK.

Performance in the Field

The results were interesting. The RC96 controller plugs directly into the RJ11C jack on the CELJACK and the controller operates just as though it were connected to a standard telephone line. The only difference that the user sees is the additional time it takes for the cellular telephone to access a cell site and establish its call. All told, it takes only about seven seconds for the call to be connected once the patch is dialed. Something inherent in the cellular network, not the CELJACK, causes the delay.

The CELJACK worked so well at the UHF site that we decided to install one at the VHF repeater site. The K3OIH VHF repeater on 147.15 MHz is located at the Blue Knob Ski Resort in south central Pennsylvania. The machine has fantastic coverage, providing communications on a 200-mile stretch of the turnpike.

Although regular land line service was in place at the VHF site, the commercial rate that the association was paying was within two dollars of the cost of cellular service. This, coupled with the limited local calling of the regular phone service, was stacked up against the extensive local calling area of the cellular network. Cellular technology let us provide local calling into two area codes—over 150 exchanges.

Now, members from the local area, as well as from Pittsburgh, can use the patch to call home and advise friends and family of their well being without the need of relaying messages.

For the Blue Knob Repeater Association, the CELJACK was the answer to our autopatch problems. Now, if we could just figure out how to get free cellular service . . . 73

Contact David Love NU3T at RD 1, Box 186-B, Williamsburg PA 16693.

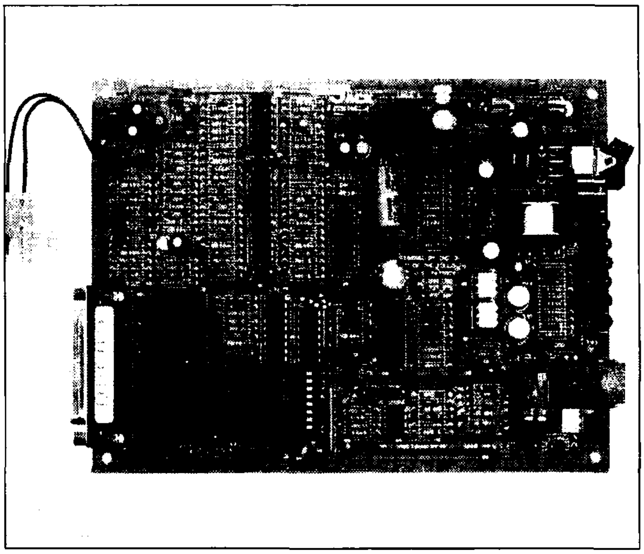


Photo A. The CELJACK.

Hamsats

Continued from page 51

sign and easy to use. When A-O-10 or A-O-13 is within view, the antenna array can be aimed at the satellite and then the azimuth can be "tweaked" for the best received signal. The obvious drawback is what happens when the satellite moves with respect to the ground observer.

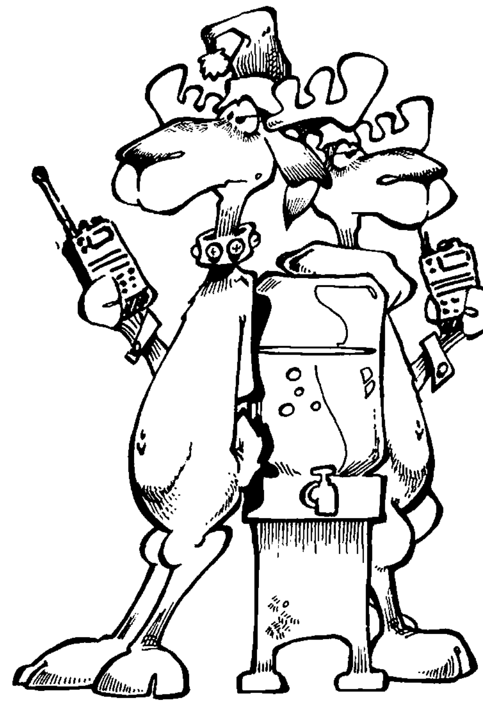
Signals will fall off or exhibit "spin modulation" faster than with typical crossed yagis or helix types. It might be very difficult to get good reception from fast-moving satellites in low earth orbit, but the elegance of the system and its ability to correct for home-brew construction errors in matching harness lengths and quagi construction (typically widebanded) can overcome the disadvantages.

More DSP

The September 1990 "Hamsats" column provided a first look at the AEA DSP-1232 and the DSP-2232 multimode data controllers. Since then, more information has become available on the L. L. Grace DSP-12 digital-signal processing unit. Brooks Van Pelt KB2CST of L. L. Grace has announced that the DSP-12, a stand-alone device, is a high-powered, very high speed communications processor. In its present configuration, it can handle HF, VHF and satellite (PSK) packet, Morse, RTTY, (AMTOR and WEFAX will be available later this year) with over 40 software modems. Unlike typical hardware-intensive modems in use today, the DSP configuration allows modems to be "written" in software. When a new data-communications mode is developed, software can be written and loaded into the system.

The DSP-12 does not require EPROM changes to run new modes. The heart of the unit is the Motorola DSP 56001 chip in conjunction with a V40 microprocessor. It uses a single RS-232 port, operating at speeds between 110 and 19,200 bps for all control, operational and software loading functions. It has three radio ports to alleviate the confusion of wire swapping when changing between bands.

The basic unit is to be priced at $595, operates between 8–15 VDC at 750 mA and can be expanded with a megabyte of RAM for $149, a date/time clock backup for $29 and an eight-channel analog-to-digital telemetry/experimentation option for $49. The A/D addition can provide voice compression with digital storage when software becomes available. L. L. Grace sells a wall-mount power supply for 110 VAC operation for $19. They also manufacture the Kansas City Tracker family of satellite antenna aiming systems (available from AMSAT). For further information on the DSP-12 write to: L. L. Grace Communications Products, Inc., 41 Acadia Drive, Voorhees NJ 08043. Their phone number is (609) 751-1018.



The 1990 Holiday Gift Guide

A buyer's guide for holiday shopping.

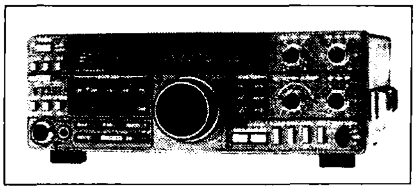
What do you buy for the ham(s) in your life? What goodies do you wish someone would wrap up for you? Check out this list of our 1990 favorites, then leave it around where your friends and family can "accidentally" find it.

HF TRANSCEIVERS

YAESU FT-1000

You'd need a large stocking to hold this top-of-the-line transceiver! It would be a welcome sight under any ham's tree. This feature-loaded transceiver offers full coverage reception from 100 kHz to 30 MHz, with one of the quietest receivers on the market AND a full 200 watts of transmit power. Price class: $3400. Contact *Yaesu USA, 17210 Edwards Road, Cerritos CA 90701; (213) 404-2700.* Or circle Reader Service number 201.

KENWOOD TS-440S



For the ham on the move, this portable transceiver gives you the option of carrying your station along with you, as well as making a fine rig for the home. Listen in to the world with the TS-440's general coverage receiver from 100 kHz through 30 MHz. This could be just the rig for a winter vacation trip to a rare tropical DX spot! Price class: $1250. Contact *Kenwood U.S.A., P.O. Box 22745, 2201 E. Dominguez Street, Long Beach CA 90801-5745; (213) 639-4200.*

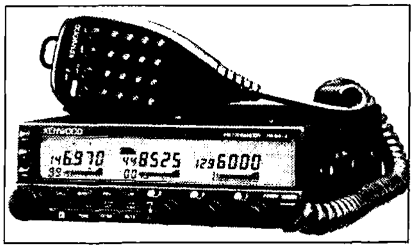
ICOM IC-726

This portable transceiver offers full ham band coverage from 160 meters all the way up to 6 meters! Explore the exciting world of 6 meter DXing. Receive coverage extends from 30 kHz to 33 MHz as well as 46.2–61.1 MHz, to round out this compact rig. Price class: $1300. Contact *ICOM America, Inc., 2380 116th Ave. N.E., P.O. Box C-90029, Bellevue WA 98009-9029; (206) 454-8155 or (800) 999-9877.* Or circle Reader Service number 202.

VHF/UHF EQUIPMENT

KENWOOD TM-941A TRIBAND MOBILE

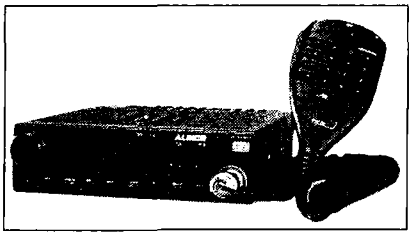
Why buy three separate rigs when you can have it all with this triband wonder? This new entry into the VHF/UHF mobile market offers



high power mobile performance on 144, 450 and 1200 MHz, all in one package. It can even be used as a crossband or triple-band repeater. Price class: $1196. Contact *Kenwood U.S.A., P.O. Box 22745, 2201 E. Dominguez Street, Long Beach CA 90801-5745; (213) 639-4200.*

ALINCO DR-112T 2 METER MOBILE

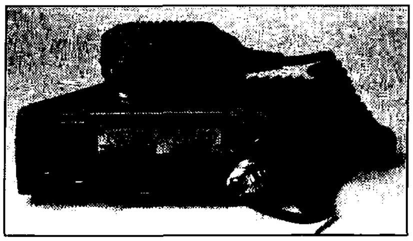
This mobile rig features an easy-to-use, full-featured control panel. A full 45 watts is available for extended mobile coverage. The back-lit LCD display provides easy viewing for



bright or dim lighting conditions. Price class: $320. Contact *Alinco Electronics, Inc., 430 Amapola Ave., Torrance CA 90501; (213) 618-8616, FAX (213) 618-8758.* Or circle Reader Service number 203.

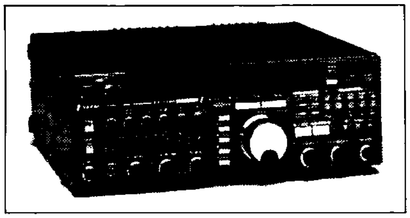
ICOM 2400A DUAL BANDER MOBILE

This powerful mobile rig offers 45 watts on 2 meters as well as 35 watts on the 70cm band. It simultaneously monitors both bands and can be operated full-duplex. In essence, you get two tranceivers in one! Price class:



$900. Contact *ICOM America, Inc., 2380 116th Ave. N.E., P.O. Box C-90029, Bellevue WA 98009-9029; (206) 454-8155 or (800) 999-9877*. Or circle Reader Service number 204.

YAESU FT-736R ALL-MODE TRANSCEIVER



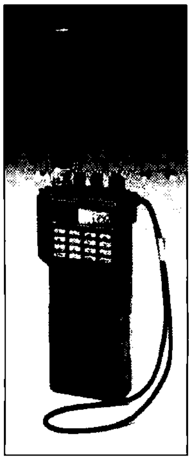
Explore the VHF/UHF world with this multimode rig. Operate on 2 meters and 70cm with an optional third band ot 50 MHz, 220 MHz or 1.2 GHz. An excellent way to experience the fascinating world of amateur satellite operation! Suggested retail price: $1922. Contact *Yaesu USA, 17210 Edwards Road, Cerritos CA 90701; (213) 404-2700*. Or circle Reader Service number 205.

HTs

KENWOOD TH-27A

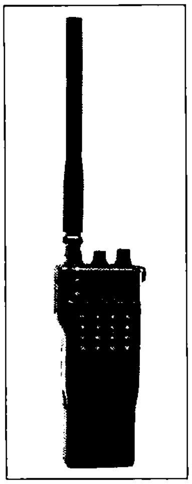
Kenwood's newest entry into the HT fray. This full-featured mini-HT has a built-in 700 mAh battery pack. Destined to become one the most popular HTs of the '90s. Word has it that Santa uses the TH-27A to communicate with the North Pole from the sleigh. Price class: $420. For more information contact *Kenwood U.S.A., P.O. Box 22745, 2201 E. Dominguez Street, Long Beach CA 90801-5745; (213) 639-4200*.

YAESU FT-411E

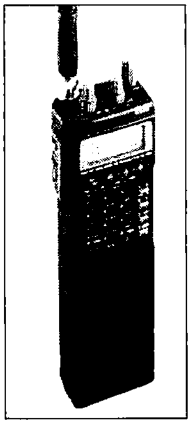


This compact HT adds new features to the popular FT-411. One-touch instant favorite channel recall, built-in PL encoder/decoder and a 10-memory auto-dialer are among some of the unique features of this rig. Suggested retail price: $406. Contact *Yaesu USA, 17210 Edwards Road, Cerritos CA 90701; (213) 404-2700*. Or circle Reader Service number 206.

ICOM 24AT DUAL-BANDER



This handheld is one of the smallest dual-band HTs you'll find on the market. This lightweight package is capable of crossband full duplex operation. Price class: $630. Contact *ICOM America, Inc., 2380 116th Ave. N.E., P.O. Box C-90029, Bellevue WA 98009-9029; (206) 454-8155 or (800) 999-9877*. Or circle Reader Service number 207.



ALINCO DJ560T

Features normally found on a mobile rig enhance this compact dual-band HT. Alinco's latest HT entry is sure to be a big hit. For prices and more information contact *Alinco Electronics, Inc., 430 Amapola Ave., Torrance CA 90501; (213) 618-8616, FAX (213) 618-8758*. Or circle Reader Service number 208.

ANTENNAS AND ACCESSORIES

ALABAMA AMATEUR ELECTRONICS

This easily-assembled series of VHF and UHF quads is sure to be a hit whenever a quick portable installation is needed. The perfect choice for foxhunting. For prices and more information contact *Alabama Amateur Electronics, 3164 Cahaba Heights Road, Birmingham AL 35243; (205) 967-6122*. Or circle Reader Service number 209.

OUTBACKER

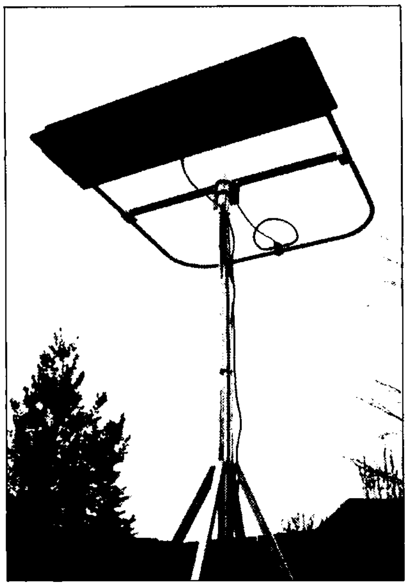
Developed in the Australian outback, these rugged mobile HF antennas really pack a punch. The unique design allows coverage of all HF bands from 75 meters to 10 meters with a simple jack arrangement. They come in decorator colors of your choice! For prices and more information contact *Outbacker Antenna Sales, 330 Cedar Glen Circle, Chattanooga TN 37412; (615) 899-3390*. Or circle Reader Service number 210.

LIGHTNING BOLT HF QUAD

Discover the many advantages of the HF quad. The strong Fiberglas™ arms can handle a lot of abuse by Mother Nature, and give you that extra DX edge. For prices and more information contact *Lightning Bolt, RD#2, Route 19, Volant PA 16156; (412) 530-7396*. Or circle Reader Service number 211.

AEA ISOLOOP

For the apartment-bound ham or for a quick portable HF antenna which takes up very little space, the Isoloop is your answer! Now you can work the world from an antenna that can



just about fit into any limited space. Price class: $350. For more information contact *Advanced Electronic Applications, Inc., P.O. Box 2160, 2006-196th Street, Lynnwood WA 98036-0918; (206) 775-7373*. Or circle Reader Service number 212.

BUTTERNUT BUTTERFLY MINIBEAM

This small beam performs like a full-sized antenna. Operates on all bands from 20 through 10 meters without lossy traps. Price class: $333. Contact *Butternut Electronics Co., 405 East Market, Lockhart TX 78644; (512) 398-7117*. Or circle Reader Service number 213.

GLEN MARTIN HAZER SYSTEM AND TOWERS

Why climb your tower when you can bring your antenna down to your level? The Hazer system allows you to easily work on your system from the convenience and safety of solid ground! For prices and more information contact *Glen Martin Engineering, Inc., Rte. 3, Box 322, Boonville MO 65223; (816) 882-2734*. Or circle Reader Service number 214.

UNADILLA ANTENNA MANUFACTURING CO.

Now you can have a **BIG**™ signal. Operate multiple antennas from just one feedline with this antenna switching system. They carry a complete lineup of baluns and antennas, as well as offering the popular James Millen™ product line. For prices and more information contact *Unadilla Antenna Manufacturing Co., PO Box 4215 BV, Andover MA 01810; (508) 975-2711*. Or circle Reader Service number 215.

SPI-RO MANUFACTURING, INC.

A fine lineup of multiband trap antennas,

dipoles and baluns. For prices and more information contact *Spi-ro Manufacturing, Inc., P.O. Box 5500, Dept. 105, Lakeland FL 33807; (813) 646-7925.* Or circle Reader Service number 216.

MFJ 962C 1500 WATT TUNER

The perfect match to keep your linear happy. The cross-needle SWR/wattmeter allows for easy matching to just about any antenna. Price class: $230. Contact *MFJ Enterprises, Inc., P.O. Box 494, Mississippi State MS 39762; Phone (601) 323-5869 or (800) 647-1800; FAX (601) 323-6551; Telex 53 4590 MFJSTKV.* Or circle Reader Service number 217.

GAP VI ALL-BAND VERTICAL

Launch your RF into space with this unique all-band vertical that requires no tuning. Price class: $220. Contact *GAP Antenna Products, 6010 Bldg. J, N. Old Dixie Highway, Vero Beach FL 32967; (407) 778-3728.* Or circle Reader Service number 218.

THE RADIO WORKS' WIRE ANTENNAS

A full lineup of dipoles, wire antennas and accessories of all kinds. For more information and prices contact *The Radio Works, Box 6159, Portsmouth VA 23703; (804) 484-0140.* Or circle Reader Service number 220.

BARKER & WILLIAMSON'S WIRE ANTENNAS

Operate from 1.8 to 30 MHz with just one antenna without using an antenna tuner. For prices and more information contact *Barker & Williamson, 10 Canal Street, Bristol PA 19007; (215) 788-5581.* Or circle Reader Service number 221.

ANTENNAS WEST'S QUICK LAUNCH SYSTEM & HAPPY HALF SQUARE

Launch an antenna system into your Christmas tree this holiday season. The Quick Launch will put your antenna supports just about anywhere you can throw it. Put those trees to good use in your yard. For those in a limited space, give the Happy Half Square a try for some real performance in an easily hidden antenna. For prices and more information contact *Antennas West, Box 50062, Provo UT 84605; (800) 926-7373.* Or circle Reader Service number 222.

PROCOMM SUPERCONE

Wide coverage antenna allows you to listen in to the VHF/UHF bands with just one antenna. Price class: $100. For more information contact *Procomm, 1948 Coventry Ct., Thousand Oaks CA 91362; (805) 497-2397.* Or circle Reader Service number 223.

DOWN EAST MICROWAVE LOOP YAGIS

These high gain loop antennas are sure to bring in those weak VHF and UHF signals. The rugged loops are made of thick bands which can survive the weight of the largest birds (probably even an eagle!). For prices and more information contact *Down East Microwave, Box 2310, RR1, Troy ME 04987; (207) 948-3741.* Or circle Reader Service number 224.

ANTENNA SPECIALISTS "THROUGH THE GLASS" MOBILE ANTENNA

Conceal your VHF/UHF mobile station with this virtually invisible antenna. Price class: $52. Contact *Antenna Specialists, 30500 Bruce Industrial Parkway, Cleveland OH 44139-3996; (216) 349-8400.* Or circle Reader Service number 225.

HUSTLER

The Hustler quick-release mobile mount allows for easy removal and mounting of your mobile mast. Price class: $20. A complete lineup of mobile antennas is available as well. For more information contact *Hustler, One Newtronics Place, Mineral Wells TX 76067; (817) 325-1386.* Or circle Reader Service number 226.

THE TEXAS BUG CATCHER

Catch more than bugs with this durable mobile antenna. Grabs QSOs like flypaper; sure to attract some attention as you drive along. For prices and information contact *GLA Systems, P.O. Box 425, Caddo Mills TX 75005; (214) 388-4724.* Or circle Reader Service number 227.

CELLULAR SECURITIES

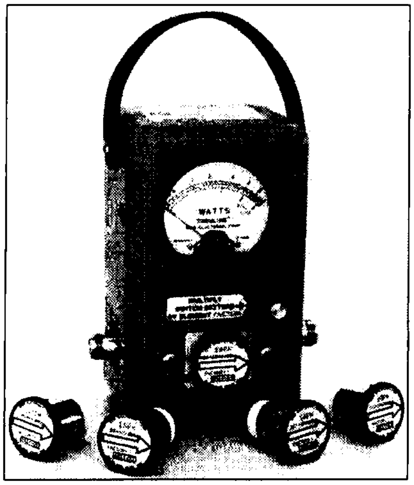
These quality built ¼-wave whip antennas are cleverly mounted in weatherproof PVC caps, allowing for easy mounting to the mast pipe. Price class: $30. Contact *Cellular Security Group, 4 Gerring Road, Gloucester MA 01930; (508) 281-8892.* Or circle Reader Service number 229.

IRELAND TUNE-TENNA HT ANTENNA

Really extend your range with this unique HT antenna. This quality antenna with collapsible whip should really make the difference for those fringe area repeater contacts. Contact *Ireland Tune-Tenna Systems, Inc., 5101-B N.W. 36th Avenue, Miami FL 33142; (305) 633-8185.* Or circle Reader Service number 230.

TEST EQUIPMENT

BIRD THRU-LINE WATTMETERS



The standard for power measurement. Just what you need to check out your transmitter and antenna. For prices and more information contact *Bird Electronic Corporation, 30303 Aurora Road, Cleveland OH 44139-2794; (216) 248-1200.* Or circle Reader Service number 231.

ALFA ELECTRONICS' TES2360 LCR/DMM METER

This flexible meter not only measures inductance and capacitance, it operates as a complete multimeter as well! Price class: $130. Contact *Alfa Electronics, P.O. Box 8089, Princeton NJ 08543. (800) 526-ALFA.* Or circle Reader Service number 233.

FLUKE MULTIMETER

The lab standard in meters. The Fluke 87 has a very useful feature allowing you to memorize your last reading, as well as a built-in LCD analog meter which really helps peak up your circuits. Price class: $290. Contact *John Fluke Mfg. Co., Inc., P.O. Box C9090, Everett WA 98206; (206) 347-6100.* Or circle Reader Service number 234.

OPTOELECTRONICS FREQUENCY COUNTERS

Accurate counters that are perfect for that special ham's workbench. For prices and information contact *Optoelectronics, 5821 N.E. 14th Ave., Fort Lauderdale FL 33334; (800) 327-5912 or (305) 772-2050.* Or circle Reader Service number 235.

C & S

A full line of test equipment including oscilloscopes and multimeters. Contact *C & S Sales Inc., 1245 Rosewood, Deerfield IL 60015; (800) 292-7711, (708) 541-0710.* Or circle Reader Service number 237.

KITS

RAMSEY

All kinds of easily assembled projects. Just the thing to get into that home-brew mood and fire up your soldering iron. For more information and prices contact *Ramsey Electronics, Inc., 793 Canning Parkway, Victor NY 14564; (716) 924-4560.* Or circle Reader Service number 238.

A & A ENGINEERING

A lineup of kits offered from construction articles published in many ham magazines. The Signal Sentry, one of their latest products, is a super-miniature touch-tone decoder, complete with an onboard microprocessor. Contact *A & A Engineering, 2521 W. LaPalma, Unit K, Anaheim CA 92801; (714) 952-2114.* Or circle Reader Service number 240.

RADIOKIT

A large lineup of kits and parts. Just the place for those hard to find RF components. For prices and information contact *Radiokit, P.O. Box 973, Pelham NH 03076; (603) 635-2235.* Or circle Reader Service number 246.

GEN-WEST VOICE BOX DIGITAL VOICE RECORDER

Why not rest your vocal chords when calling *CQ* or working those pile-ups and contests? The Voice Box will digitally record your message and play it back whenever you need it. For prices and information contact *GenWest Engineering, 1217 W. Hatcher Rd., Ste. 11A, Phoenix AZ 85021; (602) 943-5255.* Or circle Reader Service number 247.

ACCESSORIES

ASTRON POWER SUPPLIES

The source of DC power for your whole shack's needs. For more information and prices contact *Astron Corporation, 9 Autry, Irvine CA 92718; (714) 458-7277.* Or circle Reader Service number 248.

AMERITRON AL-82 HF AMPLIFIER

Turn a marginal contact into armchair copy with this fine amplifier. Price class: $2000. For more information, contact *Ameritron, 921 Louisville Rd., Starkville MS 39759; (601) 323-9715, FAX (601) 323-6551.* Or circle Reader Service number 249.

TE SYSTEMS VHF/UHF AMPLIFIERS

A complete lineup, including a new series of high-powered solid-state amps. Contact *TE Systems, P.O. Box 25845, Los Angeles CA 90025; (213) 478-0591.* Or circle Reader Service number 251.

BENCHER KEYER PADDLE

Treat your fingers to the smooth feel of this fine keyer paddle. Price class: $70–$250. Contact *Bencher, Inc., 333 W. Lake St., Chicago IL 60606; (312) 263-1808.* Or circle Reader Service number 253.

MIRAGE/KLM 2 METER AMPLIFIER

Whether mobile or in the shack, Mirage/KLM has the amplifier that will really help make the difference. Contact *Mirage/KLM, 16890 Church St., Morgan Hill CA 95037; (408) 779-7363.* Or circle Reader Service number 255.

COMMAND TECHNOLOGIES 2 METER AMPLIFIER

This all-mode amplifier will give you nearly 1000 watts of power for the real VHF DXer. Collect grid squares you never dreamed possible with this incredibly well-built package. Price: $1388. Contact *Command Technologies, Inc., 1117 W. High St., Bryan OH 43506; (419) 636-0443.* Or circle Reader Service number 256.

PACKET

KANTRONICS DATAENGINE

For the packet experimenter, this dual-port, full-duplex TNC can be used as a backbone node, high-speed or BBS station. Customize and expand your network with the Data-Engine. Price class: $310–$370. Contact *Kantronics, 1202 E. 23rd Street, Lawrence KS 66046; (913) 842-7745.* Or circle Reader Service number 257.

PAC-COMM HANDI-PACKET

This micro-TNC with its built-in battery pack allows you to take your packet station with you. The high capacity battery provides for many hours of extended operations. Price class: $230. Contact *PacComm, 3652 West Cypress Street, Tampa FL 33607; (813) 874-2980, (800) 223-3511.* Or circle Reader Service number 258.

MFJ 1278T TURBO

Operate warp-speed packet at 2400 baud with this multi-mode controller. Nine-mode operation provides maximum flexibility. Price class: $360. Contact *MFJ Enterprises, Inc., P.O. Box 494, Mississippi State MS 39762; Phone (601) 323-5869 or (800) 647-1800; FAX (601) 323-6551; Telex 53 4590 MFJSTKV.* Or circle Reader Service number 259.

AEA PK-88

This proven packet TNC now has an 8K byte personal mailbox. The perfect way to stay in touch. Price class: $120. For more information contact *Advanced Electronic Applications, Inc., P.O. Box 2160, 2006-196th Street, Lynnwood WA 98036-0918;(206) 775-7373.* Or circle Reader Service number 260.

SOFTWARE

GGTE MORSE TUTOR

Your IBM can teach you the code with this easy-to-learn package. Price class: $20–$22. Contact *GGTE, P.O. Box 3405, Newport Beach CA 92659.* Or circle Reader Service number 261.

ZCO SOFTWARE FOR THE MAC

All kinds of ham radio software to use the full capabilities of the Macintosh. For prices and information contact *ZCo Corporation, P.O. Box 3720, Nashua NH 03061; (603) 888-7200.* Or circle Reader Service number 262.

MFJ MULTICOM™

The MFJ-1289 MultiCom multi-mode control software gives you super easy-to-use menu operation for all 9 digital modes: Packet, AMTOR, RTTY, ASCII, CW, FAX, SSTV, Navtex and full-featured contest memory keyer. Price class: $50. Contact *MFJ Enterprises, Inc., P.O. Box 494, Mississippi State MS 39762; Phone (601) 323-5869 or (800) 647-1800; FAX (601) 323-6551; Telex 53 4590 MFJSTKV.* Or circle Reader Service number 264.

ELNEC ANTENNA MODELING

Plot your new antenna design from your computer keyboard. This package will let you know if your antenna will work at its optimum performance without time-consuming trial and effort. Contact *ELNEC, Roy Lewallen W7EL, P.O. Box 6658, Beaverton OR 97007.* Or circle Reader Service number 265.

LOGMASTER

The computer solution to logging those contest contacts. For prices and information contact *Sensible Solutions, 65 Warren Place, Middletown NJ 07748; (202) 949-0025.* Or circle Reader Service number 266.

SOFTWARE SYSTEMS CONSULTING

Keep an eye on the world with this easy to interface series of FAX and SSTV packages for the IBM PC. Miniature interface hooks directly to your serial port. For prices and information contact *Software Systems Consultins, 150 Avenida Cabrillo, Suite C, San Clemente, CA 92672; (714) 498-5784.* Or circle Reader Service number 132.

STOCKING STUFFERS

EZ-SCAN

Add tuning ease to your Kenwood rig with this quick add-on. Price: $6. Contact *Ham It Up, P.O. Box 779, Lompoc CA 93438.* Or circle Reader Service number 267.

CHESTER QSL CARDS

Cover your wall with all the cards you'll receive when you send them a Chester QSL. For more information contact *Chester QSL Cards, 310 Commercial, Emporia KS 66801; (316) 342-8792.* Or circle Reader Service number 270.

THE MUG FACTORY'S CALLSIGN MUGS

Always know where your mug is with this personalized creation. For prices and more information contact *The Mug Factory, 1347 South Jackson St., Montgomery IL 60538; (312) 805-5972.* Or circle Reader Service number 275.

AMATEUR RADIO STAMP T-SHIRT—PAUL WASHA WØTOK

Collect your very own stamp T-shirt. For prices and information contact *Paul Washa WØTOK, 4916 Three Points Rd., Mound MN 55364-1245; (612) 472-3010.* Or circle Reader Service number 276.

UNCLE WAYNE'S BOOKSTORE

Several new books about pirate radio and SWLing—plus many other fine selections. See the advertisement on pages 86–87 in this issue of *73 Amateur Radio Today.*

GAUTHIER'S COVERS FOR YOUR RIG

Prevent dust buildup; keeps your rig showroom new. Contact *Gauthier's Covers Plus, P.O. Box 495, Prescott AZ 86302; (602) 776-9711.* Or circle Reader Service number 277.

WELLER PYROPEN

Convenient portable soldering iron the size of a ball-point pen. Prices: $62–$85. Contact *The Cooper Group, P.O. Box 728, Apex NC 27502; (919) 362-7510.* Or circle Reader Service number 280.

73 SUBSCRIPTION

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Number 26 on your Feedback card

HOMING IN

Radio Direction Finding

Joe Moell, P.E., KØOV
PO Box 2508
Fullerton CA 92633

Hunting For PELTS

Transmitter hunting enthusiasts agree that Radio Direction Finding is unsurpassed as an exciting sport. But just like other aspects of ham radio, it also has the potential for public service. Last time, I told how hams in Utah and elsewhere use their RDFing skills to help agencies such as the Civil Air Patrol find downed aircraft in wilderness areas.

A well-tuned system is now in place for detecting and tracking the signals from Emergency Locator Transmitters (ELTs). When a plane makes a hard impact, its ELT activates, putting out 100 milliwatts on 121.5 and 243 MHz (see the photo). Emergency Position Indicating Radio Beacons (EPIRBs) are similar units for boaters in distress.

Passing aircraft, mountaintop receivers, and orbiting satellites provide first detection of ELT and EPIRB signals. Then they are tracked by Search and Rescue (SAR) volunteers and professionals using airborne, marine, vehicle-mounted, and hand-carried RDF sets.

The National Park Service reports that there were 2900 SAR incidents in 1988. Only a small fraction were for downed aircraft. Most involved lost or injured individuals. Certainly the search for an overdue backpacker or avalanche victim would be enhanced if he or she were carrying some sort of beacon transmitter.

Misuse of ELTs

A growing number of hikers and campers are carrying ELT-type beacons with them when they go into the wilderness. Skiers and climbers have gotten interested in them, too. They figure that if they get into trouble, they will be able to take advantage of the massive SAR RDF system already in place.

That's bad news, because today's ELT detection and tracking system was never intended to serve the needs of the 8 million people who take to the outdoors each year. The present ELT system is simply not capable of handling the SAR needs of both pilots and hikers. Using an ELT for anything except aircraft and boating emergencies is illegal, and those who do risk a $10,000 fine.

Already, the false alarm problem with aircraft ELTs is acute. Inadvertently activated ELTs sometimes cover up the signals from actual crashes. One source estimates that two million dollars is spent every year just to track down and shut off the ELTs turned on by bumpy landings and operator error. Increasing ELT usership will only worsen the problem.

One ham thinks he has a better idea. Communications engineer Kenneth Seymour KA7OSM of Beaverton, Oregon, envisions a separate low-cost beacon service for users of the wilderness. He began discussing his ideas with FCC engineers last year. They were enthusiastic because of the growing problem of unauthorized use of aircraft ELTs. The FCC urged Ken to submit a Request for Rulemaking (RM), which he did.

KA7OSM's proposed system was very simple. The technology would be similar to that presently in use for animal tracking and research. Only one or two frequencies would be needed. Transmitters would be low powered and pulsed at a low rate to conserve battery life and to allow multiple transmitters to be tracked simultaneously. Range would typically be one mile.

In addition to wilderness use, the proposal suggested the new service could help parents find lost children in shopping malls and enable police to recover stolen property. Ruggedized transmitters could cost less than fifty dollars. Hand-held RDF sets, including receiver and antenna, would sell for about $150 when mass produced. Voice modes were not included in Ken's service, to prevent its use for bugging.

Discussions with FCC engineers pointed to the 70 MHz region as an optimum RDF frequency range, so KA7OSM suggested that the new beacons be put on the model radio control (R/C) frequencies there.

The FCC promptly assigned number RM-6681 to Ken's proposal. The Academy of Model Aeronautics immediately objected because members did not want their R/C frequencies used. But very few others commented at that time. Last December, the FCC pressed ahead and issued Notice of Proposed Rule Making (NPRM) PR Docket 89-599 to create the Personal Emergency Locator Transmitter Service (PELTS).

The FCC Wants More

Of course, the FCC had its own idea about what PELTS should be like. Rather than embracing KA7OSM's simple system, the FCC wanted two-way voice communications in addition to RDF, saying it was important to reassure victims and assess injuries. High power base stations would be put up by state/local governments, rescue groups, and ski lift operators to talk to the portables. Individuals could own portables, but not base stations.

The FCC proposed 10 frequencies. Only one would be for emergency and homing use. The remainder would be for base-to-portable and portable-to-portable voice communications. Bases would be individually licensed, while portables would operate under a blanket base station license.

The requirement for 10 channels, some of them running high power, eliminated the possibility of using the 70 MHz R/C band. The FCC proposed putting PELTS channels at about 220.9 and 221.9 MHz, frequencies that are to be yanked from the Amateur Radio Service by Docket 87-14. That docket had set 220–222 MHz aside for Amplitude Compandored Single Sideband (ACSSB), a new narrowband technology. PELTS would use ACSSB modulation, with the channels spaced only 5 kHz apart.

The period for comments and reply comments on the PELTS NPRM ended in April. Support for the FCC's proposal has been hard to find. Many users of the outdoors want no part of it. They prefer to keep using the ELT frequencies, despite the FCC's declaration that this "...could render the existing aviation and maritime distress and safety system ineffective."

KA7OSM isn't happy with the FCC's version of his proposal. He says it's too complex and hard to implement. The requirement for 10-channel ACSSB radios will add greatly to user cost, as will the need to establish and support a network of base stations.

United Parcel Service does not like the PELTS proposal, either. According to Ken, UPS wants the entire 220–222 MHz segment for its exclusive use.

Et Tu, ARRL?

The ARRL filed against PELTS, too. The primary reason, of course, is that the matter of 220–222 MHz reallocation is not closed, and is moving into the courts. True enough, but the ARRL went further, claiming that rules compliance would probably be poor, and that PELTS is impractical because most receivers and scanners presently do not cover the proposed frequencies.

Well, that makes about as much sense as someone saying 20 years ago that cellular phones would never be popular because nobody had receivers for them. Just as cellular technology did then, PELTS will open a new market, and equipment suppliers will appear quickly. There is no need to restrict PELTS to popular scanner frequencies.

I agree that 220 MHz is not the right place for PELTS, but for a different reason. On-foot RDF in hills and mountains becomes much more difficult as frequency increases. Compared to VHF, reflections are far more pronounced at UHF; just ask anyone who has hunted on 220 or 450 MHz. Multipath slows down the RDF effort, which is certainly undesirable when lives are at stake. Multipath is severe enough on 121.5 MHz, but it is even worse at 220 MHz.

KA7OSM's proposal would have put PELTS at 70 MHz, which is a good compromise. That frequency range is low enough to avoid severe multipath from most terrain features. Lower frequencies would not be practical, because efficient transmitting antennas would get quite long, and sensitive RDF antennas would become too large for easy on-foot use.

Round Two

What will happen to PELTS? KA7OSM thinks that the FCC will re-issue the NPRM with significant changes. PELTS could become simpler, as Ken hopes, or more complex, perhaps involving satellite technology.

The biggest problem facing PELTS, or any other new service idea, is finding a place in the crowded spectrum to put it. Here are my thoughts: Let's get back to basics and make PELTS an emergency beacon system for wilderness RDF and rescue only. People who want voice communications in the boonies have plenty of other options, including CB, ham radio, 49 MHz, and itinerant VHF business channels. Without voice provisions, the potential for PELTS rules non-compliance is greatly decreased.

Eliminating the voice communications aspect of PELTS would make it simple and affordable for every hiker. Only one low power frequency would be needed. It should be selected for optimum RDF characteristics. The PELTS beacon frequency could be shared with a wideband service, such as TV broadcast.

I can hear you say, "Sharing with TV is impossible!" But, it is being done right now. Large numbers of flea-power wildlife tracking and telemetry transmitters are beeping away as you read this, on frequencies ranging from 27 to 500 MHz. Biomedical telemetry from hospital patients is being transmitted at this moment from 174 to 216 MHz, which comprise TV channels 7 through 13. Many sound systems have wireless mikes there, too.

ELTs are designed for mounting in the tail of a plane, like this one, but increasing numbers of hikers and campers are carrying them. (Photo by WB6UZZ.)

There is no unwanted QRM from these bio-emitters. Transmitter power is so low that no herringbone appears in anyone's picture. Wildlife RDF is successful because there is little television signal energy in the DF set's narrow passband, if the selected frequency is kept away from the TV video, audio, and color subcarriers.

How about a tiny piece of channel 5 (76 to 82 MHz)? Even if by some quirk there were a bit of TVI, it would only be at very short range, and would draw attention to the need for a rescue.

A dedicated rescue beacon system for users of the outdoors is sorely needed. Docket 89-599 cited the request of an international SAR council for the FCC to deal quickly with the problem of the public's demand for personal locating beacons. The longer the delay in establishing a service like PELTS, the more people will use aircraft ELTs inappropriately.

Both ELT and PELTS offer opportunities for hams interested in RDF to get involved in public service. "Homing In" will be watching for new developments. Let me know your thoughts. 73

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

Remember PICON?

As this column is being written, in late August, the newspaper, TV, and radio are filled with daily reports of the unfolding crisis in the Middle East. To the average citizen, these media represent the only source of information about world events. But for the amateur, a far more lucid view is afforded by some digging around the airwaves.

While many amateurs tune in to the various state-run radio broadcasting services from the region, to get an "on site" view, those of us who are digitalized (apologies to fellow physicians for that one) can listen in as well to the many non-voice services carrying information.

Along with providing a personal window into the action, the informed amateur can often garner some publicity for the hobby by letting a local newspaper or TV station know about his or her access to information. Here in Baltimore, several amateurs have been featured in the media with just such a premise.

In these days when we are bemoaning the apathy and attrition afflicting amateur radio, anything we can do to raise the public consciousness towards the valuable services this hobby of ours can provide can't help but attract newcomers. And, for those of you who can't remember, or never learned, the above acronym, that's the Public Interest, Convenience, Or Necessity—the premise under which amateur radio operates!

Clouded Windows

I recently purchased a new computer, one which leaves my old Turbo-88 style machine in the dust. Included with the machine were both DOS and Windows 3.0. Well, kind of.

After unpacking and setting up the machine, a computer magazine arrived with a review article on Windows, which indicated that integral with the new Windows package was a program called Toolbox, which enabled the construction of Windows applications. One such application, Daybook, was also included. Well, search as I might, I could find no such program on my disks.

So, being the good soul, I called the computer manufacturer, Gateway 2000, and asked about the missing program. At first I was assured that the Windows package included with the computer was complete, that no programs were omitted. When I pursued the point, I finally reached a salesman who confirmed that Toolbox was not included with the Windows package bundled with Gateway 2000 computers.

He added that this was a shock to him, as he apparently had the Toolbox package on his desktop computer, and was under the impression that the Windows he sold was the same as the Windows he used. It's not. A bit more research turned up the information that this omission may not be unique to Gateway 2000. It seems that each vendor may negotiate the contents of the Windows package bundled with its system. I have no information on DOS, but this may also be more fluid than one might think. So, we return to the venerable principle, caveat emptor, let the buyer beware. Before buying a computer system with bundled Windows or DOS, ask just what that package contains.

Loop de loop

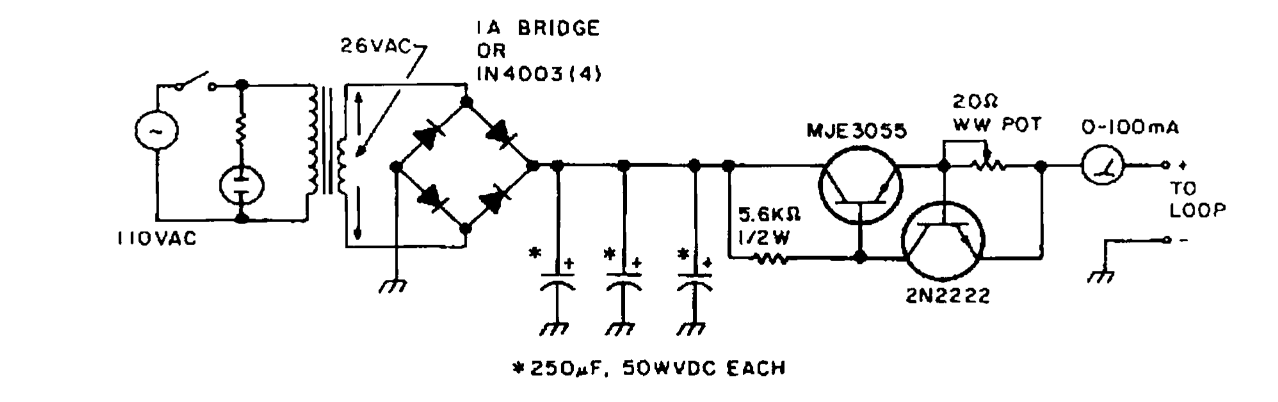
I received an inquiry recently about, you'll pardon the expression, a RTTY loop supply. It seems that some of you are building or using a solid state interface which is, itself, loopless!

Well, fret no longer. See the figure for the solution.

This is a straightforward supply, which features a low voltage, current-limited output fully capable of powering an old Model 15 teleprinter. It keeps the voltage low enough to prevent frying those silicon chips that are overtaking our shacks.

The parts for this little darling should be easy enough to obtain, either from the electronics emporium in your local mall (there *is* one of those "RS" [Radio Shack] stores near you, isn't there?), or from any of a number of mail order firms. If you really want to build something, this or any project, and still can't find a source, let me know, and we'll devote some space to it.

Meanwhile, I look forward to your comments, suggestions, questions, contributions, and critiques. Send them to me at the above address, or by way of Email on CompuServe (ppn 75036,2501) or Delphi (username MARCWA3AJR). Believe me, I look forward to reading every one of them! 73



Loopless? Try this low voltage, current-limited output supply.

Number 28 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Please provide a clear, concise summary of the essential details about your Special Event. If your announcement arrives here too late to be included in the magazine, it will be entered in the /HAMFESTS SIG on our BBS, (603) 525-4438. 8,0,1.

NOV 4

KAUKAUNA, WI The Fox Cities ARC will hold their Hamfest at the Starlite Club on Rte. 1. Check-in for testing at 8:15 AM. Testing at 9 AM. Table reservation address: *Don Baker, 621 W. 7th St., Kaukauna WI 54130.* For info call *(414) 766-3886.*

NOV 10

WEST MONROE, LA The Twin City Hams Hamfest will be held at the West Monroe Convention Center from 9 AM-3 PM. Free swap tables and Flea Market. Free parking. Handicap facilities. VE Exams. Talk-in on 146.25/.85. Contact *Benson Scott AE5V, 745 40 Oaks Farm Road, West Monroe LA 71291-9432 (318) 323-3478.*

MILWAUKEE, WI The Milwaukee Repeater Club will sponsor the 6th annual 6.91 Friendly Fest at Serb Hall from 8 AM-1 PM. Sellers start at 7 AM. Tickets $4. 4' tables $5. License Exams. Talk-in on 146.91 and 146.52. To save $1 per ticket or table send SASE with payment to *The Milwaukee Repeater Club, PO Box 2123, Milwaukee WI 53201*, before Nov. 3rd

NOV 11

ALLAIRE, NJ The Garden State ARC, Jersey Shore ARC, Neptune ARC and Ocean-Monmouth ARC will sponsor a Hamfest at the Allaire Expo Center, Allaire Airport from 8 AM-3 PM. Vendors 6 AM. Tailgating, VE Exams, Ham Radio & Computer demos. Fly-in frequency: 123.0 unicorn. Talk-in on 145.110 -600, KC2Q/R. 146.520 simplex. Admission $4 advance, $5 at the door. Children under 12 and XYL free. Tables $20. Tailgate $8. Contact *Al Jackson NK2O, PO Box 635, Eatontown NJ 07724. (201) 922-8121.*

MASSILLON, OH The Massillon ARC will sponsor "Auctionfest '90" at the Massillon K of C Hall on Cherry Road from 8 AM-5 PM. Sellers set-up at 7 AM. Free parking. Advance admission $3.50, $4 at the door. Tables $7 per 8' space. Auction starts at 11 AM. Talk-in on W8NP, 147.78/.18. Send SASE with payment to: *MARC, PO Box 73, Massillon OH 44648.*

NORTH HAVEN, CT The SCARA indoor Ham Radio/Computer Flea Market will be held at the North Haven Park and Recreation Center from 9 AM-3 PM. Tables $15 advance, $20 at the door. General admission $3 per person. Talk-in 146.01/.61. Reservations for tables must be received with check by Nov 1 and no reservations by phone. For info/reservations, SASE to: *SCARA Flea Market, PO Box 81, North Haven CT 06473* or call *Brad at (203) 265-6478* between 7 PM-9 PM.

NOV 16

VERONA, NY The Madison-Oneida ARC holds VE Exams the third Friday of every month at the Madison-Oneida BOCES on Spring Rd., beginning at 7 PM. W5YI-VEC affiliated. Contact *Leonard Popyack WF2V Phone (315) 853-8974, or on 146.79, 145.37, WF2V @ WA2TVE, or POPYACK@TOPS20.RADC.AF.MIL.*

NOV 17

BILLERICA, MA The Bull HN 1200 Radio Club, and the Waltham ARA, will sponsor their annual Amateur Radio/Electronics Auction at the Bull HN plant, 300 Concord Rd. Doors open at 10 AM. Free admission and parking. Talk in on 146.04/.64 and 147.72/.12 repeaters. For info contact *Mike Rioux NW1J, 132 Killam Hill Rd., Boxford MA 01921.*

NOV 17-18

FT WAYNE, IN The Allen County Amateur Radio and Technical Society will hold their 18th annual Ft. Wayne Hamfest at the Allen County War Memorial Coliseum Exposition Center from 8 AM-5 PM Sat. and 8 AM-3 PM Sun. Set-up Fri. 5:30-9:30 PM, Sat. 5-7 AM. VE Exams. Admission $5 advance, $5.50 at the door. Reserved tables $30 premium, $15 regular, power $25 extra. Talk-in on 146.88- and 443.80+. Send SASE to *ACARTS, PO Box 10342, Ft. Wayne IN 46851 for tickets and tables. (219) 693-3766* (evenings).

TAMPA, FL The 15th Annual ARRL Suncoast Amateur Radio/Computer Convention, sponsored by the Florida Gulf Coast AR Council, will be held at the Curtis Hixon Convention Center on Ashley Street. Hotel reservations may be made at the Ramada Airport Hotel by calling *1-800-228-2828* before Nov. 6th. (Mention the Suncoast Convention for the convention rate.) For info call *(813) 854-1105 or (813) 442-3830.*

SPECIAL EVENT STATIONS

OCT 31-NOV 1

BREVARD, NC The Transylvania County ARC will operate K4AIF to celebrate Halloween from the Devil's Courthouse in Transylvania County from 2100Z Oct. 31-0200Z Nov. 1. Frequencies: SSB—3.860, 14.295, 50.150; Simplex—146.52 FM. For certificate, send a legal size or 9 x 12 SASE to: *Dick Gustafson K4AIF, 302 Wilson Dr., Brevard NC 28712.*

NOV 8

CLINTON, NC Sampson County ARS will operate AB4TT from 1700Z-2400Z in conjunction with the Sampson County Expo and Pork Festival. Operation in lower portion of General bands plus ten meters; 28.100-28.500. QSL via: *SCARS, PO Box 64, Clinton NC 28328.*

NOV 10

VIC AUSTRALIA Australian Ladies' Amateur Radio Assoc. Contest starts at 0001 UTC and ends at 2359 UTC. Bands: 3.5, 7, 14, 21, and 28 MHz only. Frequencies: 28.380-28.410, 21.190-21.200/.380-21.410, 14.250-14.280, 7.070-7.100, 3.560-3.590. Operation: Phone and CW. Each station counted twice on each band for credit; once on phone, once on CW. All contacts must be in accordance with license regulations. No net or list operation, no crossmode. Procedure: Phone-call "CQ ALARA CONTEST," CW-YLs call "CQ TEST ALARA," OMs call "CQ YL." Exchanges: ALARA member: RS or RST, serial No. starting at 001, ALARA member, name. YL non-member: RS or RST, serial No. starting at 001, or OM name. Scoring: Phone: 5 points/ALARA member contacted, 4 points/YL non-member contacted, 3 points/OM contacted. CW: contacts where at least 1 operator is Novice class count double points. SWL: 5 points/ALARA member logged, 4 points/YL non-member logged. Logs must show date/time UTC, band, mode, callsign worked, report & serial No. sent, report & serial No. received, name of operator of station worked, and points claimed. Also show full name, callsign, address and signature of operator. No carbon copies. No logs will be returned. Australian YL Novices entering for the Mrs. Florence McKenzie CW trophy should indicate their CW score separately. Logs must be received by Contest Manager *Mrs. Marilyn Syme VK3DMS, PO Box 91, Irymple. 3498, Vic. Australia*, before the Dec. 31st deadline.

NOV 10-11

WASHINGTON, DC HAMVETS will operate N3EKX near the Vietnam Veterans Memorial to commemorate Veterans Day. Operation will be on 20, 40, 75 meters in the General portion of the bands. For picture QSL, send QSL and SASE to *K9ICF, 13300 Wye Oak Dr., Darnestown MD 20878.*

DX

Continued from page 52

always seemed that the AC line voltage was low. However, I never actually measured it. Also, I often felt that I was copying stations longer than they heard me. I have no doubt that a small linear would have helped. Incidentally, with the usual DXpedition approach of "you are 59," it is easy to be lulled into believing these signal strengths. Often signals did not move the S meter—"You're 59—QSL?" Often the signal was S4 or S5—"You're 59—QSL?" I worked five bands—80 through 10 meters. I stayed away from the WARC bands because I didn't want to rock the boat. I could certainly claim 80-10 meters as exclusively radio amateur (more of less), but I did not want to cause any problems with possible QRM on other bands—perhaps not even recognized. Still, I had the usual requests: "When will you be on 10, 18, 24 MHz?", "Will you be on FM on 29 MHz?", etc.

One of the thrills of getting on RTTY was that, as far as I have been able to find out, the Kingdom of Bhutan has never been available on this mode. It was strange, but this mode really fascinated my friends. I think the screen readout had something to do with it. I demonstrated keyboard Morse, automatic Morse readout, random Morse generation, and so on. It was a huge success. The first ever RTTY QSO took place between Gin JA1ACB, and A51JS on the second day of operation. Again, judging by the pile up, it was a popular mode with hams in general. A beam would have helped—the pile-up QRM was tremendous. I would be inclined to use FSK in any future operation or pick up some receiver selectivity—the SSB filter is much too wide when using AFSK.

Finally, back in the relative cold of Thimphu, I was soon wrapped up once again in my regulation clothes (two pairs of socks, vest, shirt, pullover and parka). In the room there was a small blower type heater of about 1 kW rating, with the lowish voltage I reckoned on about 800 watts. It helped, but!!!

I met Pradhan A51PN on several occasions and we got on very well. I was sorry that he was not able to operate as A51PN immediately, but there were a couple of formalities to complete. In any case, I left an ICOM 740, my trusty Butternut HF6V, a microphone, an AT200 antenna tuner, and some coax cable. In various discussions I had mentioned that I would like to meet Yonten, ex-AC5TY. This was arranged and, despite being a very busy government official, Yonten gave me a very warm welcome. We had a courteous meeting in his office and we talked about old times, his travels and activities as AC5TY.

I was very lucky in that Sherab, in his capacity as Deputy Chief Engineer, showed me around several of the Bhutan Wireless Stations. There is an extensive network in the Kingdom. A great deal of the traffic is CW so all of the operators (including Sherab) are very proficient in Morse. The equipment was usually driven by batteries (with charger) and operated on a multichannel SSB/CW link. All circuits were very busy.

I also attended one of the Morse classes, training new operators. After using a Bencher paddle for so many years, my brass pounding was very rusty. Still, it's like riding a bike (so they say)—once learned, never forgotten. Within a few minutes I could feel my confidence returning. My fist gradually improved to send tolerable Morse. It was all good fun.

On top of this station there was a triband beam—I was tempted to ask if I could borrow it for a week—but it was used on a very busy Indian circuit running just below the CW edge of 20 meters. By all accounts, the circuit was "solid" most of the time. *It used an* FT-101.

Leaving the HF6V vertical meant that I could use the rig more or less until I was due to leave. There would be no need to QRT the evening before, but Murphy had one final say. The propagation was so terrible that my planned final multi-hour marathon came to nothing. At about 2300 local time I finished packing and my operation as A51JS was over.

Early Wednesday morning we left the Molithang Hotel and Thimphu for Paro Airport. I felt really sad. The Druk Airline plane left on schedule and so it was good-bye to Bhutan after my three-week stay. Once again we were not allowed off the plane in Dhaka and by lunch time I was back in Bangkok for another two-day transit stay.

During this stay in Bangkok I arranged to get all my excess baggage through as unaccompanied baggage, a much cheaper solution. In Bangkok I had a very strange feeling that it had all been a dream. Had anyone really worked A51JS? Had I really been in Bhutan?

Back at home on Saturday afternoon my mind was set at rest. The inevitable pile of mail awaited my arrival, and a great deal of it was for A51JS.

I would like to thank many people, but if I thank Sherab Dorji maybe that will be enough. Without his continued efforts on my behalf (and, for that matter, on behalf of amateur radio in the Kingdom of Bhutan) A51JS would never have become reality. To the members of the H.I.DX.A. Club, to all my fellow DXers who helped, and to the RSGB and the ARRL—sincere thanks. All acknowledgments of assistance appear on the A51JS QSL card.

Tashi Dalek (may your journey be a safe one). 73, Jim VK9NS.

Number 29 on your Feedback card

BARTER 'N' BUY

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73 Flea Market*, Barter 'n' Buy, costs you peanuts (almost)—comes to 35¢ a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to the *Barter 'n' Buy*, Donna DiRusso, Forest Road, Hancock NH 03449 *and get set for the phone calls.*

Never Say Die

Continued from page 4

much too late. If the League has been doing their WARC-'92 homework I'm not aware of it. . .and I, unlike reasonable men, read those boring board minutes in *QST*, which is certainly where I should find out what, if anything, is being done.

Yes, if I generously donate to the cause, I expect I'd help pay to provide some ARRL directors (and their families) with a great vacation. I'd probably also be paying their salaries while they're away from work. Would my generosity help them stay in the world's most expensive hotels instead of the places I would go?

Yes, I know it was unreasonable, but somehow I managed to fight off the urge to answer their call for money.

A Club Opportunity

You've been reading my editorials on killer electric blankets and water beds. You've been reading the same news in almost every news magazine, so you may by now almost about have begun to suspect that I did my homework before writing.

We've shown you how to build a milligaussmeter to check homes for safe 60 Hz field strengths. Now, has your ham club bought or built a gaussmeter and gotten publicity in your local papers and over local radio (and TV) stations, offering to gauss out homes for people who are wondering if they are exposing themselves and their children to dangerous low frequency fields?

What a great opportunity to get publicity for your club, and to provide a desperately needed community service. Or is your club made up entirely of reasonable men who are incapable of imagination and frozen by inertia? Your club could easily save dozens to hundreds of lives and have a ball while doing it.

Yes, the local power company will probably fight you tooth and nail, pooh-poohing the whole exercise. Remember how the tobacco companies bought scientists to explain that there really was no absolute proof that cigarettes kill you? The power companies have invested in the best scientists their money can buy and they are singing the same tired song. But I'll bet none of the power company people, their lawyers or their scientists are using electric blankets any more.

How many children can you save from leukemia? How many people from deadly brain tumors? I'll be watching the club newsletters to see what your club is doing. I haven't seen one peep yet in any newsletter. Darn, there I go being unreasonable again!

But this is just one example. With some imagination your club could get into the papers several times a year. There's always something newsworthy going on, once you get thinking in those terms. Some clubs make a big deal out of Field Day and get a whole page in the newspapers, plus a few minutes in the evening news. That's solid gold selling of our hobby.

Yes, sigh, someone has to do the, sigh, work of writing the news releases, calling the editors, and organizing the promotion. No reasonable man would volunteer for that. Heck, no one with any sense (reasonable) volunteers for anything. Let someone else do it. . . I think I'll have a beer.

De-Blathering

It was RTTY that got me into this whole publishing mess 40 years ago. Well, there was one aspect of RTTY that was really great. Without that, I don't know if I'd have gotten hooked so thoroughly.

Let me be blunt. Even 50 years ago, in 1940, most ham contacts were routine and boring. It's incredible how little that down side of amateur radio has changed in 50. . .probably 70 years. But RTTY, in addition to being a substantial technical achievement, provided two additional bonuses.

First, since it required a lot of building and a good deal of effort to get the equipment and get it running, the chaps who managed that hurdle weren't average hams. I found most of them very interesting to contact.

"Kids today aren't exaggerating when they say they don't have time for ham radio."

Second, most of us put in punched tape systems for automatic transmissions. This meant that I could put together rather extended pieces on interesting subjects without the pressure of knowing someone was waiting on the other end for me to get through typing. I'd write and punch the stuff into tape at my leisure. Then, during a contact, when something came up which was covered by a punched tape, I'd reach up and pull the tape off a hook and feed it into the tape transmitter and it would zip through at 60 wpm. Since I had a wide variety of interests, I had lots of punched tapes hanging handy.

Also, if the incoming message looked interesting I could turn on the tape punch and save it for re-transmission to someone else. Remember, this was back before magnetic tape was available. We did have wire recorders, but they weren't easy to use.

During the last 40 years tape recording technology has progressed remarkably. Yet how many hamshacks have a cassette recorder?

I wonder if anyone has thought about making cassettes on topics which might be of interest to the chaps being contacted? It wouldn't be a big deal to have a bunch of five and ten minute cassettes to tell about things of interest.

For instance, I have a cassette which is being sold through gift shops all over New Hampshire. It's called, "How To Speak N'hamsha Like A Native." How I got the idea for this, made it and put it on the market is an interesting story. My skin diving trip to the Caribbean last year was another saga worthy of a few minutes of tape. Or my DXpedition to St. Pierre last year.

If I had these stories on tape, I'd be more likely to run 'em and perhaps provide slightly more interesting contacts. I'm lazy, like almost everyone else, so I tend to not get involved in long stories during my contacts.

Yes, this sort of thing can easily get out of hand. . .and the next thing you know we'd have more ham broadcasting stations sending out "ham bulletins" ten times a day on 14,285 or something.

As anyone knows who's sat through my talks at hamfests, I can go on for hours. And that's without any questions. They trigger even more talk. With only the slightest of encouragement I'll bet I could provide enough talk to keep a 24-hour a day ham broadcast going for weeks.

Do you know that the first trans-Atlantic ham contact was made by a pirate and that no one knows to this day who he was?

Let's see if you can hook your cassette recorder into your rig and keep the RF feedback out. With that technological leap maybe we can organize some more interesting contacts.

Those of you who've been into slow-scan have been using your cassette recorders to save pictures from DX contacts. . .and to send your own SSTV programs. Some of these programs are pretty good. Years ago I held an SSTV contest for the best programs and I got dozens of first rate ones.

The next time you're sitting there reciting your name, QTH, and other such trivia for the several thousandth time, give some thought to having a few programmed cassettes at hand to spice up your QSOs.

If you have a computer with a hard disk you can put the info on it, making it even easier to access. And you'd have something to write about, too.

Thanks, Horace Mann

When the federal government took over education in America and instituted compulsory schooling, it was with the goal of managing the mass population and producing people whose behavior could be predicted and controlled.

It all started in Massachusetts around 1850, by the way. It took them over 30 years to overcome the public's resistance. . .sometimes with guns. It's perhaps interesting that the literacy rate was 98% before compulsory education and has never gotten above 91% since in Massachusetts. Why, it's almost enough to make someone think!

Under this system our children are separated from other age and social class groups and held captive for some 30 hours a week. They sleep about 56 hours, watch TV 55 hours (national average), spend about eight hours a week getting ready, going and coming home, plus seven hours a week on homework (unless they're Asians), which leaves them around 12 hours of their own. . .or to talk with their families. Is it any wonder we have millions of brainwashed "reasonable" people coming out of this cookie-cutter system?

For some reason I was aware of how bad the system was and I despised it. I didn't see much difference between being a kid and being a slave. I was about 12 when I figured this one out.

The great American people mold works fine. . .for America. It sure stinks for individuals. Our federal school system is a socialist system. It's dictated by the federal government . . .the same system they used to try and run businesses in the USSR and the Eastern Bloc with such disastrous results. The government is unable to handle a planned economy. . . and that includes education as well as transportation, communications and so on. You can't name one business the government has ever been in that it didn't screw up. And that, sadly, includes the government itself. What a mess!

Kids today aren't exaggerating when they say they don't have time for ham radio. Not unless they can get away from TV. Talk about an addictive drug! Millions of women get enormously upset if they miss their soap operas. Even if they're out working they tape 'em. TV is entertaining. It's FREE!. . .particularly if you fast forward through the commercials. Most of it is mental chewing gum.

With TV so entertaining, and with kids being fed it every day from birth on, it's no wonder that they have so little interest in reading and hobbies other than video games. School, which is compulsory, is so dull it destroys their interest in learning. And with schools adjusted to demand a minimum of effort, we have the recipe for today's kids.

In a few schools the teachers have gotten together to fight the system. They've made monumental efforts to get the parents interested in their children's education, and the results have been spectacular. I don't know what's going to happen to the kids when they get into the usual old fashioned garbage compactor high school. Perhaps it'll turn them back into reasonable people.

Progressive schools are starting to encourage after-school clubs again. Teachers are giving the extra time despite the non-union hours involved. If you have an unreasonable ham club president perhaps he can talk with the school principal and arrange to have your club members elmer a school radio club. The time is ripening for this as a few schools try to fight their way out of mediocrity. We hams have a lot to offer. Heck, we might even manage to cut in on the kid's TV watching.

The reasonable approach is the Russian one. (1) It can't be done. (2) I'm tired. 73

ATV

Number 32 on your Feedback card

Ham Television

Bill Brown WB8ELK
% 73 Magazine
Forest Road
Hancock NH 03449

The *73* ATV Balloon

Living near the Atlantic Ocean is great. . . unless you're trying to launch a balloon package and have it land on solid ground! After several weekends of high winds in the jet stream (guaranteed splashdown in the ocean) and bad weather at the launch site, we finally got a winner on July 23rd. It was a perfectly calm day, allowing us to easily inflate the balloon outside. Liftoff occurred at 2:03 p.m. EDT, from the parking lot of *73* headquarters in southwestern New Hampshire. The balloon slowly headed off toward the Nashua/Derry area.

The balloon payload consisted of a 100 milliwatt 2 meter FM transmitter (144.340 MHz) with a Digitalker™ altimeter. The ATV payload consisted of a 1 watt P.C. Electronics KPA5-RC (their new R/C ATV transmitter module) transmitting on 426.25 MHz along with a video ID board with four special graphic screens.

The HF net was operated on 7.155 MHz by net control stations Bob N1EDM and Carl N1FYZ. Bob and Carl did an excellent job running the net and keeping everyone updated on the launch progress. At *73* headquarters, David N1GPH provided a blow-by-blow description of the launch. At least 70 stations from all over the northeast provided continuous reception reports and helped track the balloon's progress across New Hampshire.

Ups and Downs

Although the 2 meter signal died at 50,000 feet, strong reception was reported all over New England. The talking altimeter/ID was only partially successful. The ID worked OK but the altimeter section just relayed random numbers. Apparently a wire broke loose on the board.

The ATV signal was received over most of New England at P3 to P5 levels. The balloon signal even brought up the W1NRE ATV repeater in West Haven, Connecticut. The furthest north reception of the ATV signal was reported by VE2BOS in Quebec City, Canada (P1); to the south, W2DTC saw a P2 picture in Red Bank, New Jersey. Mike WA1PTC reported a P5 picture from 60 miles away from his portable station on top of Mt. Agamenticus, Maine.

My computer prediction indicated a possible touchdown just east of Derry, New Hampshire. I told Warren WB1HBB he should get out a large net and try to catch the payload since he lived near Derry. It appeared that the package landed within a mile of his house!

Into the Swamp

At least six chase vehicles swarmed into the area looking for the payload. Members of the Interstate Repeater Society (IRS) and hams from across southern New Hamsphire teamed up to track down the balloon. Two of the trackers had a mobile ATV station as well (KA1CRN and WA1PTC). Special thanks go out to Larry KA1CRN, John N1HFE, Arnie N1BAC, and Dave N2GE for their repeated visits to the launch site during the previous scrubbed efforts.

Overhearing the chase effort on the Derry repeater, a passing pilot offered to give one of us a ride in his Cessna to help search the area.

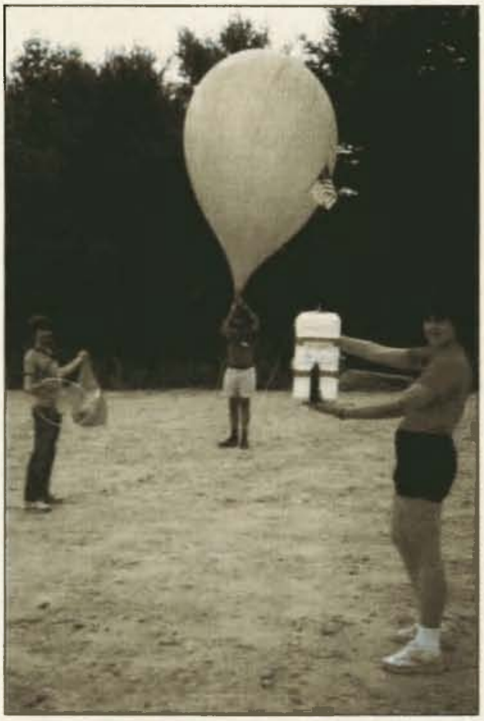


Photo A. The 73 balloon ready for launch. Left to right: Nuge WB8GLQ, John N1HFE and Mary Cassidy

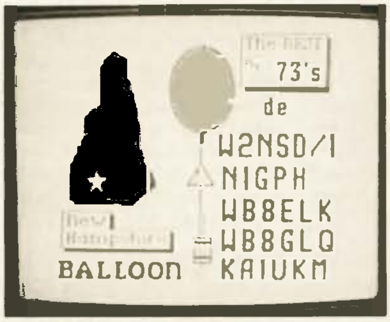


Photo B. Balloon transmission as received by Mike WA1PTC on Mt. Agamenticus, Maine (60 miles distance)

Lane WA1LCW flew along with a scanner on 426.25 MHz. He acquired a definite signal near a swamp. At one point he shouted, "I see a bright orange parachute-like object in someone's backyard. . . A lot of people are crowded around it!" Bill WA1DMV drove up to the house to investigate. He walked behind the house to observe a dozen folks sitting around a large orange picnic blanket. With an airplane circling above them and Bill walking in on them carrying an HT, I'm sure they thought they were in the middle of a government raid!

Using the chase plane's best location fix and plotting beam headings from all over the region, we were able to triangulate the balloon payload's position within a mile or two. As near as we can tell, the payload landed in a mosquito-infested swamp near Big Island Pond. The area is filled with bogs and quicksand which made recovery impossible. We hope to search the area again when it freezes over and the killer mosquitos die out!

Since the launch, two low altitude search flights have been made. Lane WA1LCW and Mike WB2WNX did a photo survey of the area four days after the flight. The following day I went on another airplane trip with Rich KB4N and Gene WA1UXA to take another look. Nothing has been seen as yet.

Stratonet Sky Beacon Success

The first flight of the K4BV Sky Beacon 1 last July was stopped short when the balloon ripped open at 2600 feet. Apparently a small hole developed near the nozzle while they were holding onto the balloon during high winds before launch.

Live Camera Flight

After several weeks of redesign, John Bayne N4EEB, Vic Leisner W3LGV and Bill Leisner W2MPU put together a whole new package. Their latest attempt was a success! Launch occurred Sept. 15th at 10:43 a.m. EDT from the Deland airport, about 20 miles west of Daytona Beach. Their new package contained a 1 watt 2 meter FM transmitter which relayed a tone sequence indicating internal and external temperature as well as the altitude. The ATV payload consisted of a Uniden B/W camera mounted in the bottom of the package. A transparency with the callsign written on it was suspended in front of the lens. Talk about a high tech-video overlay! The transmitter operated on 434 MHz using a P.C. Electronics KPA5-RC. The antenna was a dual-band vertical mounted on top of the payload. To conteract the spinning problem encountered on previous balloon flights, a balsa wood weathervane was attached to the package. It apparently worked out very well as excellent views of the Earth below were received over the whole state of Florida clear down to the Keys. The weathervane did its job—the image was very stable during the ascent.

At the highest altitude, the 2 meter signal was heard as far away as Valdez, North Carolina, by W4YIU. Reception of the 2 meter beacon and ATV reception was reported in a good portion of the Southeast.

The HF net operated on 7.155 MHz, with Frank KB4T as net control. The net sounded much like a NASA launch with remote patches directly to the launchsite on 2 meters. In addition, Ernie K4RBD linked the launch preparations and the liftoff back to the K4BV ATV repeater in Daytona Beach. Although the net control station was 20 miles away from the launch site, he could watch the launch activities via the repeater and report it all to the net. Stations in the Daytona Beach area were watching the pre-launch activities as well.

After rising for 1 hour and 43 minutes the balloon burst at 94,000 feet. During descent the balsa weathervane broke off, causing the package to spin around at rates approaching 92 RPM!

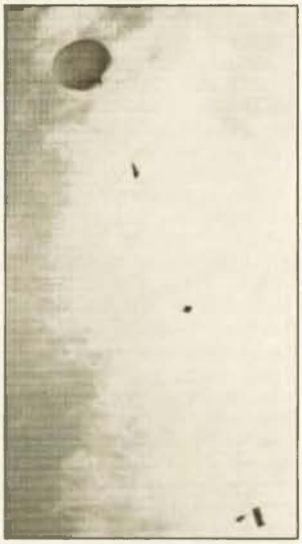


Photo C. The K4BV Sky Beacon balloon at launch. Deland Airport, Florida. Photo by John Bayne N4EEB

Photo D. Ken Vanslette WB4FKL is boosted up to grab Sky Beacon 2 from the tree. Larry Webster N4URS (left) and James Crabtree N4VZL (right) aid in the effort. Photo by John Bayne N4EEB.

Photo E. Larry Webster N4URS proudly displays his find! James Crabtree N4VZL (left) radios the news back to the rest of the chase team.

Vic W3LGV used his SSTV converter to freeze-frame the images which showed the roads and canals during the final stage of descent. He was actually able to find the balloon's location, using a road map of the area to help direct the chase team to the right spot.

Recovery

There were six chase teams and two airplanes involved in the tracking and recovery effort. Bill Morse WA4OBY flew alongside the payload in his plane during the first 14,000 feet after takeoff. Bill W4MPU and Bruce KB4GW took off in the second plane during the descent to aid in the search effort. It took about two hours to home in on the signal after landing. As members of the chase team closed in on the landing site they started to receive snow-free images from the payload. They were surprised to see the smiling face of Larry Webster N4URS peering up into the camera lens as the package dangled from a tree limb 25 feet above him.

The final touchdown point was 15 miles east of the launchsite near the town of Samsula (New Smyrna area). According to the tracking crew, the package had headed out to sea for awhile. Fortunately, a few minutes before landing it caught an onshore wind which brought it back to solid ground. It was found just seven miles short of the Atlantic coast. 73

ABOVE AND BEYOND

VHF and Above Operation

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San Diego CA 92119

Questions and Answers

This month I will cover mailbox comments and questions about some of the projects I've presented in this column. Questions always make me dig deeper in the electronics section at the public library. While this can be time-consuming, I enjoy it, as it serves to increase my own understanding of electronics. I do not profess to be an expert, rather an interested observer willing to apply the information to projects for our microwave bands.

Low-Noise, High Gain MMIC

Our first topic comes from Ron Geisler of Eastlake, Ohio, concerning the noise figure of wideband amplifiers covering hundreds of MHz (see the April 1990 issue). Ron knows that the broadband MAR series of MMIC amplifiers have a noise figure of about 5 dB. He desires information on devices that give a much lower noise figure but keep the broadband frequency coverage to about 1300 MHz.

Well, Ron, in *73 Magazine*, Electron Processing advertises a preamp good from 1 MHz to 1300 MHz, with a 2.8 dB noise figure, for $70–$100 (with remote mounting option). For more information, you can write Electron Processing at P.O. Box 708, Medford NY 11763, or call them at (616) 228-7020.

Home construction is another alternative. Using a special MMIC amplifier, you can build a preamp with the desired specifications. The Avantek INA-02170, for example, boasts 31.5 dB gain at 500 MHz with a 2 dB noise figure, and 25 dB gain at 1.5 GHz with a 2.8 dB noise figure. The INA-02170 is one in a series of Avantek MMICs that are fabricated from Avantek's 10 GHz ISOSAT™ silicon bipolar process. It is packaged in a high reliability, hermetic, gold ceramic mounted package for applications meeting industrial and military specifications.

The device is used much the same as a standard MMIC amplifier of the MAR series. The difference is the high gain and high output power (+11 dB) coupled with the very low broadband noise figure possible with this device. See Figure 1 for typical application data.

Now the bad news. Compared to a standard MMIC such as the MAR series, an INA-02170 costs more. MAR devices, which are limited to a 5 dB noise figure and relatively lower gain, cost less than $2 each. The INA-02170 costs $36.45 each in small quantities and $29.25 in quantities of 25. But I feel it's a bargain, considering the lower noise figure and high gain. Contact Avantek, 481 Cottonwood Dr., Milpitas, CA 95035 at (408) 432-3080 for the name of your nearest distributor.

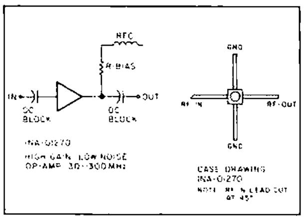

Figure 1. INA-02170 Amplifier.

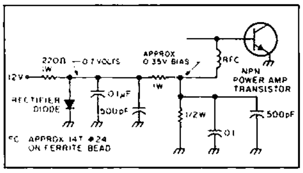

Figure 2. DC bias circuit for power transistor amplifiers (SSB operation).

Solid State Amp

Vikki Welch questions the use of converters to stretch the base station into several bands. She was not satisfied with the lower power level of most converter systems. While not wanting to burn a hole in the sky, she wants a device with enough power to operate with.

Referring to the 6 meter solid state power amplifier in the September 1989 issue of *73 Magazine*, Vikki wants to know the values for the RF chokes used in the amplifier. Well, Vikki, I started the design from Motorola application notes that covered devices similar to an A50 (50 watt NPN power device at 50 MHz) transistor I had in my junk box. The values for the RFCs are as follows: The base RFC (RFC3) is about 10 turns of #22 wound on a large (0.35") ferrite bead (inductance about 10 µH). RFC1 (collector DC feed) was 10 turns of #22, air-wound, ½" in diameter, but I later replaced it with 10 turns wound on a 2 watt resistor, value not critical. RFC2, originally 18 turns on a T-50-6 ferrite core, was similarly replaced in the manner of RFC1.

The point is that the values are not critical, but you need a good RFC to ensure that it's doing its job—bypassing the RF. You can vary the bias circuits in almost any circuit constructed for class "C" operation (CW or FM), making them usable for SSB operation. See Figure 2 for a typical bias arrangement.

The bias circuit is tied into the lower end of the RFC (which is grounded for FM or CW operation), giving the transistor a bias voltage to turn the device on (slightly). The device will fully turn on with 0.7 volts on the base, going into hard conduction. What we want to do is control the base voltage to turn the transistor on just a little bit so the collector starts to draw a little current; say, about 50 to 100 mA. This makes the transistor stage operate in the linear portion of its curve. This requires a voltage in the range of 0.3 to 0.4 volts; any higher and the device will go into full conduction.

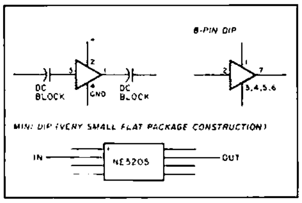

Figure 3. NE-5205 Amplifier.

If you have a DC ammeter in the circuit, you should see a small increase in collector current without RF drive, applied as you adjust the bias on. The idea is to draw a small amount of collector current for SSB use, making the circuit linear. If your bias circuit is adjustable, set the collector current to about 50 mA for each device in your final amplifier. If the amplifier is to be used for FM, no bias is required for class "C" operation. For linear operation, the transistor is operated in a class "A" to "A/B" range.

Adjusting New Amplifiers

When adjusting a new amplifier for the first time, it's best to begin with the input circuit match, and tune for best SWR. (DC collector power is not required at this time.) If it is on, use short adjust periods to avoid overheating. When you're finished, remove the drive, turn on the amplifier (DC power), and adjust the collector circuit through its full range. Watch the current meter for any increase in current indicating oscillations, and if there are any, re-position components to minimize any instability in the circuit.

Most amplifiers tend to be oscillators and most oscillators tend to be amplifiers. For most projects, you just have to do a little work to stabilize them. This procedure is not limited to the 6 meter power amplifier, but is typical of most amplifier alignment steps. Just be careful when working with expensive devices. Watch the dissipation ratings, and especially the polarity, as simple errors in judgment can ruin the device. With solid state devices you don't get a second chance; they can go up in an invisible smoke screen faster than you can say "X?•#!!!". Think the operation through first, then perform the step.

Michael Circ of Toronto is working with low frequency antennas for his Sony Pro-80 VLF receiver on 80 to 150 khz. He'd had trouble with a signetics wideband NE-5205 op amp. This 8-pin DIP op amp has a gain of 20 dB from DC to 600 MHz, with a 50 ohm impedance and noise figure of about 6 dB. The test circuit is almost identical to a standard MMIC amplifier's circuit. See Figure 3.

Michael questions the input match to a short telescoping antenna, and he's having trouble with the circuit. Michael, I have had similar troubles with some of the packaged amps, and I find that a high impedance FET gives a better match and a noise figure of less than 1 dB.

In tests, I found that the ferrite antenna N6IZW and I constructed was superior to a wire or telescopic antenna. You could use other material, such as a stripped antenna loop from an old FM tuner, to construct a similar, compact antenna, or buy a new ferrite rod from Amidon Associates, PO Box 956, Torrance CA 90508, phone (213) 763-5770.

You can add a short telescopic rod to the hot end of the ferrite antenna's coil. This would tend to make the antenna less directional than the ferrite rod by itself. See the February 1990 issue of *73* for details on the ferrite antenna.

A similar circuit, developed by David Curry WD4PLI, appeared in the June issue of *73*, page 30. He used a J-310 low-noise FET on the input circuit and a low-pass filter to reduce broadcast interference. His circuit uses a 5 to 10 foot wire antenna. Check out his article; it's quite a good construction project. He even has a kit available with all components for those interested. If you missed his article, write to *73 Magazine, Forest Road, Hancock NH 03449* for a copy.

Brian Grose KB7Y is looking for a source of 1N23 diodes. With the rise in popularity of 10 GHz operation, these sought-after detector diodes are getting hard to find. I remember when we were more interested in finding 1N4007s for our high voltage power supplies, and ignoring the 1N23 types. Now the 1N4007 is 10 cents and the 1N23 is $10. Quite a turn of events.

Why do some diodes cost so much? Coding of the devices starts with the plain vanilla or 1N23, which has a high noise figure of about 8 to 10 dB at 10 GHz. Next come the 1N23A, B,C,D,E and so forth. Each successive letter designation indicates a slightly lower noise figure. I believe the 1N23F, with about 5 dB at 10 GHz, is about the latest type available.

The 1N23WFR, a modification of the basic "F" diode, does not have a lower noise figure than the 1N23F. The "R" indicates that it's "reversed" from normal. See Figure 4. You can place the diode in a circuit of either polarity by removing the base sleeve and reversing it so that you can place it on the other end of the diode. Of course, low noise diodes with reversible polarity cost more than the plain old 1N23s. They all work well, but the lower the noise figure, the more sensitive your system will be.

Instead of running out and ordering devices, look in the junk boxes at swap-meets. The best place is in old microwave test sets and echo boxes once used for military radar applications. Some of them have one or more front panel devices, with spares in the lid of the set. Check it out. That junk radar test set could just be hiding

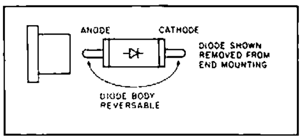

Figure 4. Microwave diodes (1N21–1N23 types).

lone or two or up to five 1N23 devices.

Additionally, several detector mounts or commercial military dual detector mounts are on the surplus market. They're usually turned down since the mounts are not for a frequency of interest. So what? If the price is right, just remove the diode and discard the piece of metal, if you don't need it. Usually you can obtain such items for bargain prices, around five dollars.

During the first thirty minutes of a large swapmeet, I have been known to be very antisocial, and even show up with a downward-looking stance, hat in place. I guess my brand of disease is parts-orientated, and must be satisfied by a hound dog hunting approach. While it is addictive, it usually subsides in twenty minutes to half an hour, and eventually returns you to back to normal. Hope you have good luck scrounging your local swapmeets. I might even bump into you at one, after the initial twenty minutes or so.

New Microwave Product

Emcom Industries (Ed Emich) is introducing a 10 GHz wavemeter of very compact design from *The RSGB Handbook*, available for amateur use for about $100. The wavemeter is self-calibrating and capable of identifying frequencies to an accuracy better than 5 MHz at 10 GHz. It's simple to use, requiring only a coupling hole drilled into a section of waveguide for mounting. Unlike commercial wavemeters, which tend to be large and bulky, this six-inch-long wavemeter fits in your palm, making it adaptable for mountain topping and field frequency measurements.

The wavemeter is micrometer driven. Using your existing detector or external relative output meter as the reference indicator, you can adjust the wavemeter for a dip in power. When you see a dip output power on your external meter, note the micrometer reading and jot it down (quarter-wave reading). Then continue to adjust the micrometer in the same direction till another dip in the meter is observed (three-quarterwave reading). Now subtract the first reading from the second reading and divide the answer into 299.600 to obtain the operating frequency in MHz at 10 GHz. (Normally-300,000 is the correct number, but 299,600 is the correction for temperature and 32% humidity). The meter works from 9 to about 11 GHz. Contact Ed Emich at Emcom Industries, 10 Howard St., Buffalo NY 14206 or phone (716) 852-3711 for this and other items being developed for amateur microwave use.

Next month, we'll get back to the 6 GHz oscillator project. As always, I will be happy to answer any questions concerning VHF/UHF or microwave related items. Please send an SASE for a prompt reply, which you will receive except during 10 GHz contests and ARRL conventions. 73, Chuck WB6IGP.

Low Power Operation

Mike Bryce WB8VGE
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The DB25 Rig

After several months of talking about VFOs and other means of controlling transmitter frequency, this month is a 180 degree turnaround. This month's project was the effort of Michael Czuhajewski WA8MCQ. Here's a short story on how this month's rig got its name.

"One day WB3EVS showed me a small plastic bottle which had previously contained DB-25 connector pins (for RS-232 computer use). A common bottle size is 3½ drams, with an inner diameter of 0.8 inches and a length of 1.4 inches. This is about 40% of the volume of a 35mm film canister, the size for the DB25 Challenge. Anything that would fit inside was defined as a DB25 rig, whether a receiver or transmitter.

"Initially I was confident of my goal to place a transmitter inside the container, but doubted that my partner could fit an entire transceiver inside. As things turned out, both our goals were achievable."

Specifications

WB3EVS and WA8MCQ loosely agreed on some rules: no surface mount devices; components and techniques had to be common and available; no one-transistor transmitters or crystal set receivers; transmitters must have at least an oscillator and amplifier, along with harmonic suppression on the output; crystal control, if used, could be external, but any VFO had to be inside the bottle; and finally, the rig must be capable of making actual contacts on the air. The output power was not specified, but they aimed for at least ¼W. A lot of things were not spelled out, to allow room for experimentation and innovation. They accepted this project as a challenge, rather than a competition.

Details of the Challenge

The rig is based on the "W1FB Tuna—Tin Two" from the May 1976 issue of *QST*. It puts out ½W on 40 meters. WA8MCQ used a piece of 0.8" x 1.4" perfboard with 0.1" hole spacing.

By comparison, WA5JAY built his rig on three perfboard discs, with the layers stacked on top of each other. QRP high-rise! His method was much more space-efficient. WA8MCQ quickly abandoned the idea of mounting the parts on both sides of the board. As a result, the only parts on the bottom are a resistor, a toroid, and a trimmer capacitor.

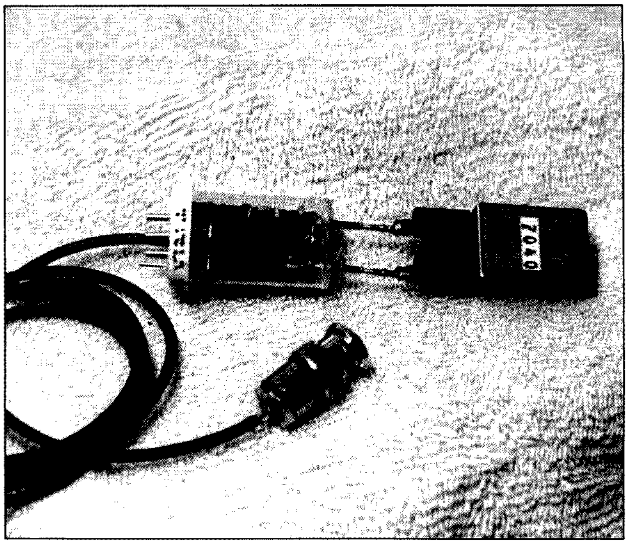
Wiring is all point-to-point, with several wires often sharing one hole. All external connections were made with wires coming out of the bottle. The participants in the DB25 Challenge suggest that at least one connector be included on the bottle, if possible.

WA8MCQ used a pair of 2N3904s for the crystal oscillator and amplifier. The plastic cases of the transistors were filed to obtain the same size heads and reduce bulk. WA8MCQ added another transistor to allow for a convenient method of keying the rig. "I cheated a bit," said WA8MCQ, "and used a 2SC2458 pulled out of a junked TS930S." You could also use a 2N3906.

Miniature parts such as 1/10 watt resistor, monolithic capacitors, and T25 and FT23 toroids, were used extensively. Both male and female DB-25 pins were used as connectors. These were tied onto the board with a single strand from stranded wire. The wires were then re-soldered for rigidity.

Matching pins are plugged into the wires for the crystal, power and key. The antenna connected via a piece of RG-174 coax terminated in a BNC plug. Two more pins were soldered onto a crystal socket, so it could be plugged into the bottle.

You can stick a jeweler's screwdriver through a hole in the side to tune the trimmer capacitor to pull the crystal frequency about 800 Hz. Power output ranges from 250 to 500 mW, depending on the frequency. The oscillator may be keyed or left on continuously while transmitting, depending on crystal activity. Jumper the appropriate pins on the board to select either mode. To key the oscillator along with the final, connect point "A" to point "B." To keep the oscillator running all the time, connect point "A" to point "C." The external T/R switch turns on the 12-volt transmit line.



The entire DB25 rig.

WA8MCQ: "As any QRPer knows, ¼ watt is sufficient when coupled with a good antenna, propagation, and operator skill. I put the rig on the air over two weekends and made 10 easy contacts in seven states on 40 meters."

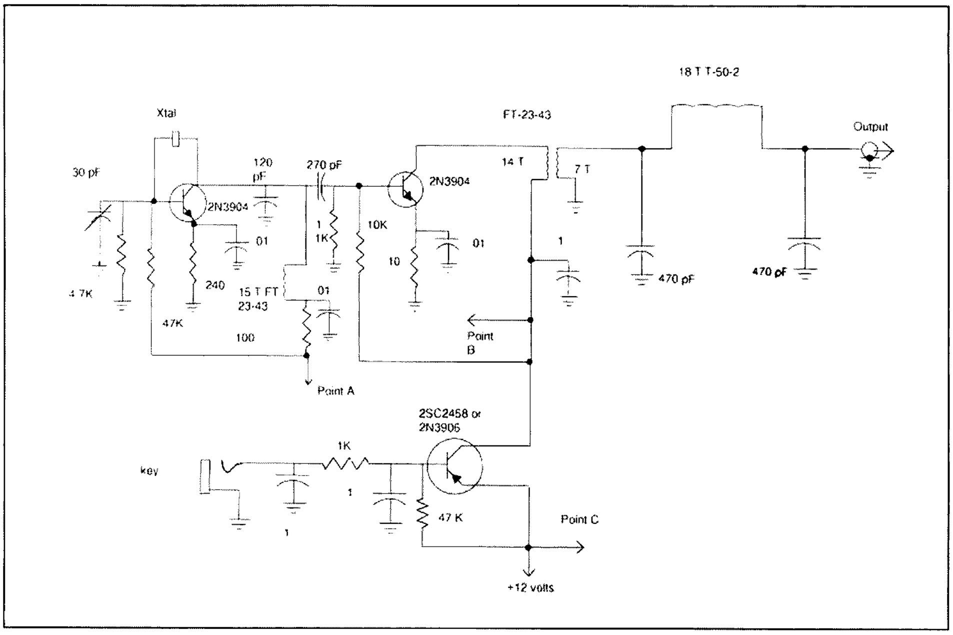
DB25 Contest

Are you up to the DB25 Challenge? Well, let me sweeten the pot. How about working 100 countries with the DB25? To do this, you'll need some guidelines to follow. These guidelines will be the same as those Mike WA8MCQ and Robbie WB3EVS adopted, with a few more I'll add myself:

If crystal controlled, a maximum of 10 crystals can be used. Since DB25 plastic bottles may be a bit hard to come by, you can use a 35mm film bottle. Fuji film comes in a clear plastic bottle. Maximum power output is 500 milliwatts. If VFO control is used, it must be internal. No net contacts or contacts made with higher power, and then switching to the DB25 will be allowed. The 100 countries must be on the active ARRL DX list. No contacts allowed before 1/1/91, to give everyone a fair start. Maximum time for completing the task will be two years.

Of course, you'll need the QSL cards, but photocopies will be fine. And a photograph of your rig.

So, what will you get out of all of this? How about a nice-sized trophy! One you'll be proud to show off to the rest of the world, and let them know just what 500 milliwatts can do. All from a rig you can put inside your shirt pocket. 73



The schematic for the DB25 transmitter. Use 1/10 watt resistors and VERY small components.

RANDOM OUTPUT

David Cassidy N1GPH

Two or three young guys, sitting in a garage or basement. Along the wall is a table. On that table is an assortment of equipment, most of which would be quite familiar to the average ham (in fact, at least one of the young guys is probably a licensed amateur radio operator). The light from a single, dim bulb barely illuminates the equipment: an AM transmitter (something on the order of an old Heathkit, Johnson, or maybe even something the guys have been putting together themselves from scrounged parts), a cassette player, a D-104 microphone and assorted home-brew meters, switching boxes and processing gear. Notebook paper, all covered with a handwritten scrawl, is spread in disarray across the table. A stack of cassette tapes sits patiently before the player. The soft glow of the transmitter's finals escapes through the vent slots and adds a peaceful orange glow to the dim scene.

The transmitter is checked one last time. It is tuned precisely to 7.415, grid and plate are normal, the output is right around 50 watts and the SWR is rock steady at 1:1. A switch is thrown. The "transmit" light shines steadily. Someone hits "play" on the tape player and the microphone output is raised to mix with the down-home blues song coming from the cassette. The guys take a last hit off of their long-neck Budweisers, and one of them howls like a wolf into the silver disc of the D-104. This ain't no amateur radio. this is pirate radio!

Radio Pirates

Until recently, I hadn't really given much thought to this illegal fringe area of the radio hobby. With almost no exceptions, those who pursue this form of freedom of speech are careful to stay out of the amateur bands. It's difficult enough evading the long arm of FCC monitoring stations without having thousands of hams looking for you. I had never gone looking, nor had I ever stumbled upon, a pirate radio broadcast. Then, I picked up a copy of Andrew Yoder's excellent book, *Pirate Radio Stations: Tuning Into Underground Broadcasts* (available for $12.50 from Uncle Wayne's Bookshelf). Yoder's well-written book gives a complete overview, both historical and current, of the world of pirate radio stations. With his advice fresh in my mind, I started listening for these radio outlaws. This past Labor Day weekend, I was successful in monitoring one.

The station identified itself as W-O-R-K, "Workers Operating Radio Knobs." Their programming consisted of blues-oriented rock music and comedy skits. The signal quality was a bit on the weak side, further impaired by continuous static crashes, but I heard enough to verify the reception. I've written up a reception report, sent it to the mail drop address given during the broadcast, and I'm patiently waiting for the all-important OSL card.

If this mysterious branch of SWLing is something you want to check out, I can offer a few suggestions I've picked up. Pirate broadcasters confine their activities to a few narrow segments of the radio spectrum. Your best bet is to listen around 7.415 MHz, from 0200 to 0600 UTC, on a major holiday weekend like Labor Day, Memorial Day, July 4th, or Thanksgiving. In fact, one of the biggest times of the year for pirate radio activity is right around the corner—Halloween. If you listen to 7.415 on Halloween night, and you live in the eastern half of North America, you can almost guarantee that you'll hear something. April Fool's Day, and any time a Friday the 13th rolls around, are also good times. Other frequencies worthy of some monitoring are 1610–1630 kHz, 6200–6325 kHz, 6800–7000 kHz, 7355–7530 kHz and 15010–15100 kHz.

I would suggest that you pick up a copy of Yoder's book. It is a great overview of the entire topic. Another good resource is *The Pirate Radio Directory* by George Zeller ($7.95 at Uncle Wayne's Bookshelf). It gives information on over one hundred pirate stations including when and where they were last heard, programming notes and OSL information. For really up-to-date information, get in touch with The Association of Clandestine Radio Enthusiasts. They publish a monthly bulletin *(The ACE)* devoted to the topic. Sample copies are available for $2 from *The ACE*, P.O. Box 11201, Shawnee Mission KS 66201. You might want to check out the ANARC SWL net on 7240 kHz every Sunday morning at 10:00 EST. They discuss various topics of interest to SWLers, and they often have valuable information of interest to pirate chasers. Pirate station operators have even been known to inform the net of future broadcast plans.

What Do You Think?

The reason why I brought this whole thing up was to get your opinions. Some of you may think this topic too controversial for an amateur radio magazine. Others may feel that any topic concerning the transmission of a radio signal is fair game. Still others might be totally ambivalent. Either way, I'd like to hear what you have to say about it. Do any of you actively SWL these stations? Photocopy some QSLs and send them in. Have any of you operated such a station? Are any of you currently involved in pirate broadcasting? (You can write anonymously if you wish, but I assure you that your identity and QTH will go with me to my grave.) Should amateur radio operators be concerned about these outlaws, or are they really brothers and sisters following a different path to the same end?

Don't dismiss them out of hand, folks. These people are mostly highly skilled technicians who are very serious about their stations and the issue of free speech. They believe in freedom of the airwaves to the extreme that they're willing to risk heavy fines and jail terms to make their point about who should have the right and opportunity to broadcast a radio signal. I'm not necessarily defending their illegal broadcasts, but I think it would be a mistake brought on by simplistic thinking to say they should all be heavily fined and thrown into jail until they came around to the "proper" way of thinking.

Let me hear from you. If there's enough interest, maybe we'll publish some articles on the subject. If not, well . . . I know where I'll be this Halloween at 0200 UTC. ■

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 Chateau Circle
Payson AZ 85541

Ready for Good HF?

This month is expected to be very good for HF radio propagation, with very few disturbances. It's possible that the first few days of the month will exhibit high magnetic field indexes (see the "A" index) with accompanying poor conditions on the 20–10 meter bands, but by the 4th or 5th, you ought to have plenty of DX coming through.

Again around the 14th and the 25th or 26th, you may find some magnetic field disturbances, but in general you will enjoy November's offerings for short and long skip. Bands will close sooner because darkness arrives early, but this is an advantage for those who enjoy DX on 160, 80, 40, and 30 meters. Reduced atmospheric noise will make conditions even better, with low QRN.

Cycle 22

The jury is still out regarding where Solar Cycle 22 is heading. At the time of writing this (late July), the sunspot numbers have remained steady and on a "plateau," with little change for about six months! Various forecasts have been made about the peak of Cycle 22. Some say it was in late 1989; others say early 1990; and still others say it will be in August of 1990. Perhaps they are all wrong, and there will be no peak as such, other than the plateau of fairly high values that don't approach the peak of earlier cycles.

It's too early to tell what Cycle 22 is going to do, but one thing is certain: It is like no other cycle in the several hundred years of sunspot observation! That period of time isn't even a wink in Old Sol's eye when we're dealing with a scale of *several billion* years . . . so anything could happen that has never been seen before! Be prepared for unusual solar activity in the next several years.

As always, listen to WWV (5, 10, 15, 20 MHz) at 18 minutes after any hour to find a current "A" index, "B" index, and solar flux values. Trends will be indicated by the announcement covering the last 24 hours and the next 24 hours.

Compare the MUF data on the band-time-area chart for an overall picture of when and where to find DX, and then use the daily chart to discover what "conditions" are likely to be on the days you want to work DX. P = Poor; F = Fair; G = Good. Example: P–F means Poor tending to Fair. ■

EASTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	—	20	—	—	—	20	20	—	—	15	[illegible]
ARGENTINA	15	[illegible]	20	40	40	—	—	10	—	—	[illegible]	[illegible]
AUSTRALIA	[illegible]	20	20	20	20	40	[illegible]	20	—	—	—	[illegible]
CANAL ZONE	15	[illegible]	[illegible]	[illegible]	[illegible]	15	15	10	10	10	20	10
ENGLAND	20	40	[illegible]	[illegible]	40	—	—	15	10	15	15	20
HAWAII	[illegible]	15	20	20	[illegible]	[illegible]	20	20	—	—	—	[illegible]
INDIA	20	20	—	[illegible]	—	—	—	15	—	—	—	—
JAPAN	10	—	20	—	—	—	20	20	—	—	15	[illegible]
MEXICO	15	[illegible]	[illegible]	[illegible]	[illegible]	15	15	10	10	10	20	10
PHILIPPINES	15	—	20	20	—	—	20		10	—	—	15
PUERTO RICO	15	[illegible]	[illegible]	[illegible]	[illegible]	15	15	10	10	10	20	10
SOUTH AFRICA	[illegible]	40	20	20	—	—	—	[illegible]	10	10	15	15
U S S R	40	[illegible]	20	20	—	—	—			—	20	20
WEST COAST	[illegible]	[illegible]	[illegible]	40	40	—						20

CENTRAL UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	[illegible]	15	20	20	20	—	20	20	—	—	—	[illegible]
ARGENTINA	15	15	[illegible]	[illegible]	20	—	—	10	—	—	10	[illegible]
AUSTRALIA	[illegible]	15	15	—	20	[illegible]	40	20	—	—	15	10
CANAL ZONE			[illegible]	[illegible]	[illegible]	—			[illegible]	10	10	10
ENGLAND	40	[illegible]	40	—	—	—	—	—	15	15	20	20
HAWAII	15	15	15	20	20	[illegible]	40	20	—	10	10	10
INDIA	15	[illegible]	—	—	—	—	—		15	—	—	—
JAPAN	[illegible]	15	20	20	20	—	20	20	—	—	—	[illegible]
MEXICO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—	[illegible]	[illegible]	10	10	10
PHILIPPINES	[illegible]	—	20	20	—	—	—	—	[illegible]	[illegible]	—	—
PUERTO RICO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—	[illegible]	[illegible]	10	10	10
SOUTH AFRICA	—	—	20	20	—	—	—	—	15	15	[illegible]	20
U S S R	—	—	—	—	—	—	—	15	15	15	20	20

WESTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	[illegible]	[illegible]	15	20	20	20	—	20	20	—	—	15
ARGENTINA	[illegible]	15	15	20	20	—	—	[illegible]	[illegible]		10	10
AUSTRALIA	10	[illegible]	15	15	20	20	20	—	20	—	—	—
CANAL ZONE	10	15	[illegible]	[illegible]	[illegible]	[illegible]			10	10	10	10
ENGLAND	20	20	—	—	—	—	—	—	15	15	[illegible]	20
HAWAII	[illegible]	[illegible]	15	[illegible]	[illegible]	[illegible]	40	—	15	10	—	—
INDIA	—	15	20	—	—	—	—	—		15	—	—
JAPAN		[illegible]	15	20	20	20	—	—	20	—	—	15
MEXICO	10	15	[illegible]	[illegible]	[illegible]	—	—	—	10	10	10	10
PHILIPPINES	10	10	—	—			—	20	15		—	—
PUERTO RICO	10	15	[illegible]	[illegible]	[illegible]	—	—		10	10	10	10
SOUTH AFRICA	20	20	—	20	—	—	—		—	10	15	15
U S S R	20	—	—	—	20	—	—	20	20	20	20	20
EAST COAST	[illegible]	[illegible]	[illegible]	40	40	—	—					20

NOVEMBER 1990

SUN	MON	TUE	WED	THU	FRI	SAT
				1 P	2 P	3 P–F
4 F	5 F–G	6 G	7 G	8 G	9 G	10 G–F
11 F	12 F–P	13 P	14 P	15 P–F	16 F–G	17 G
18 G	19 G	20 G	21 G–F	22 F	23 F	24 F–G
25 G–F	26 F–P	27 P	28 P–F	29 F	30 G	

73 INTERNATIONAL

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N. Swanzey, NH 03431

Notes from FN42

November has arrived. For the citizens of the United States it means national voting and of course a very American holiday called Thanksgiving. It is a time of giving thanks for what we have, as the Pilgrims who landed at Plymouth Rock did so many years ago.

What do we in the international ham community have to give thanks for? I think the primary thing is the lowering or destruction of barriers to communication. We are now able to communicate face-to-face, not just by radio, with hams in all of Germany; we are able to send QSL cards directly to hams in the USSR, not just Box 88, Moscow. More countries, like Israel, are lifting communications restrictions with other countries, and more areas are becoming available to DXpeditions. We can be thankful for all the frequencies we have available, and for the many people who worked hard at WARC-79 to get these frequencies for us.

The next World Administrative Radio Conference (WARC) will be held starting February 3, 1992, less than 16 months from now. How is this going to affect us? I honestly don't know, but I do know that commercial interests want more frequencies, whether HF, VHF, UHF, or even higher.

We are more communication-oriented than ever before. How many of you have a commercial radio or cellular telephone in your car that you didn't have back in 1979? Will the cellular phone industry need more frequencies? Probably so, and where will they get them? From our ham bands? HF broadcasting also wishes to increase its frequency spectrum in the 40 meter band.

I am happy to say that there is an international organization, the International Amateur Radio Union, that attempts to preserve our frequencies. It's composed of many national organizations, such as the United States Amateur Radio Relay League (ARRL), the Japan Amateur Radio League (JARL), and many others. The IARU and national ham organizations will be working hard to conserve what we now have, and even attempt to gain new frequencies for us. What can we do to help?

We can provide support for these efforts! What kind of support? I can't provide technical support because I am not that technically able, and I can't provide physical support because I can't take the time off from my job to go. But I can contribute financially to help pay for those who do attend. I urge all hams, worldwide, to do the same. Support your national organization with a donation, no matter how small. What happens in 1992 will determine what frequency privileges we will enjoy thereafter. Don't be a couch potato; get involved!—Arnie, N1BAC

Roundup

Japan From *The JARL News.* Last spring the JARL and the RSF (USSR) reached an agreement to allow the JARL to participate in the International ARDF Competition that was held from June 2 to 8, 1990 in Krasnodar, USSR.

The Japanese team, led by Mokoto Inami, Vice President of the JARL, consisted of 14 members. Everyone participated in the competition side-by-side with other nationals, and the spirit of cooperation and lasting friendship formed easily.

On that occasion, the JARL and RSF agreed to exchange ARDF teams, with the JARL inviting the RSF team to the National Foxteering Competition this October in the Hyogo area.

As a result, the friendship between the JARL and RSF will most certainly be deepened.

Special event station 8J6JEN will operate until November 4, 1990, from "The Journey Exposition, Nagasaki 1990." Operation began last August 3. The Exposition hopes to rediscover Nagasaki's rich history of international exchange and to serve as a place for people to meet and exchange views and enhance human communication.

The Netherlands From *Radio Netherlands*, Programme Information Release, fall. Two years ago we published the last edition of the "Receiver Shopping List," a free consumer guide to the receiver market. At the start of 1989 we stopped sending it out because the information was no longer current. BUT, the new 12th edition of the "Receiver Shopping List" is now back from the printers.

The new list includes price checks made in Holland, Canada, Britain, the US, Japan, South Africa, New Zealand, and Australia. If you would like a copy just write to: English Section, Radio Netherlands, Box 222, 1200 JG Hilversum, The Netherlands; or FAX +31 35 724352. Ask for the "Receiver Shopping List," Edition 12. *[The list is 56 half pages long, lists 31 receivers, and contains other useful information, such as a section on finding parts for older sets. It's well done, and it's FREE.—Arnie]*

ISRAEL

Ron Gang 4X1MK
Kibbutz Urim
Negev MPO 85530
Israel
Packet: 4X1MK@4Z4SV

Ham Radio and the "Situation." At the time of this writing (late August), storm clouds are gathering in our region, and the situation is full of uncertainties making us all a little shaky, to say the least. In past reports, I've pointed to all kinds of events in our world of amateur radio connected to larger events on the globe, showing that international harmony has been growing and pointing to what appears to be a dawning of a new, enlightened age for our planet. By the time these words are in print, the events at this time may have resolved themselves, and all one can do at this time is to express the hope for the continued betterment of our world.

Photo A. Sticker from the world's first joint Soviet-U.S. special event station, US1A.

A few months back we reported that our Ministry of Communications had lifted a ban on communications with the surrounding Arab countries with whom peace has not yet been concluded. A few QSOs have been made, and at an international forum early in the summer, a representative of the Israel Amateur Radio Club personally received some favourable comments from a delegate of one of these Arab lands. The ice has definitely been broken, yet as we have seen in the past in terms of international relations, it takes some time for the politics to follow suit.

Now a local radio station in Israel has been broadcasting some recordings from the station of 4X4WH of QSOs with stations in Iraqi-occupied Kuwait giving commentary on the situation there. Thus in the time of crises, once again amateur radio comes through providing a unique service!

Privileges Granted to Novices. The Ministry of Communications, on their own initiative (!), has granted Grade C licensees the use of all modes on the 144–146 MHz band with maximum power output of 25 watts. This will make the national repeater and packet systems available to the holders of this entry-level license requiring a 6 words per minute Morse and a simple theory and operating procedures tests. This puts the Novices into the mainstream of Israeli ham radio. The Novices have been allowed 15 watts output on CW between 7.000 to 7.050 and 21.100 to 21.150 MHz, and two years ago they were granted all modes at up to 25 watts output on 430 to 440 MHz. Not very many appeared on UHF in spite of the perk of being able to use voice, and now in the spirit of generosity, the authorities have extended the privileges. Look for the Novice callsign: a 4Z9 prefix followed by 3 letters.

Now, a month and a half after the Novices received the 2 meter privileges, their presence is really being felt on the band! In the previous year I had worked only a handful on 70 cm., but now on VHF they are really coming out in multitudes! At this early stage in the game, we hear them mingling with the veteran hams, getting all kinds of advice on technical and operating matters. One Novice callsign has been seen already on the national packet system.

This changes the very nature of the Novice experience and makes the Grade C license much more attractive! It will be interesting to note how this will affect licensing patterns. Will the Novice licensees continue to upgrade as in the past when there was a greater incentive to do so? Even though, as opposed to many countries, ham radio attracted a great influx of youngsters in Israel in spite of the rather strict licensing conditions, will there be an even greater influx of new blood into the hobby? I'll be feeling the pulse, and in a future issue will keep you informed of the trends, which could have implications for amateur radio in your country.

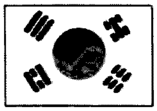
Israel soon to join the European Common License Group. By the time you're reading this, we hope the Ministry of Communications will have signed all the agreements to facilitate

our entry into the European Common License Group. This will make it possible for all hams from the CEPT countries visiting Israel to get on the air here without the minor bureaucratic hassle of getting a reciprocal license. It will allow 4X/4Z hams the same while touring the 16 CEPT countries. *[Very exciting news!—Arnie]*

In the meantime, any ham planning a visit to Israel may obtain details on how to get a reciprocal license as well as a list of the Israeli VHF and UHF repeaters by writing to me. Be sure to include a self-addressed envelope and return postage.

Hulah Valley Packeteers host TAPR head. On July 11, Lyle Johnson WA7JXD, President of the Tucson Amateur Packet Radio Corporation, was the speaker at a meeting of the Hulah Valley Packet Group held at the community center in the village of Rosh Pina. Lyle outlined the progress on the production of the TAPR high-speed packet transceiver and reported on the state of the Microsats, the flock of amateur radio satellites launched this year, many of which are carrying packet radio gear.

4X9ØBS. From October 5–6, the capital city of the Hegev, Beer Sheva, hosted an international stamp exhibition. The special station 4X9ØBeer-Sheva was set up there and operated on all bands around the clock. Not only did it give prefix hunters around the world a new one, but we hope, as in similar events, many philatelists will be infected by the ham virus!



REPUBLIC OF KOREA

Byong-joo Cho HL5AP
PO Box 4, Haeundae
Pusan, 612-600
Korea (South)

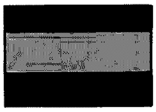
Reciprocal Agreement. I am very pleased to provide the following information concerning a reciprocal agreement for US citizens to operate an amateur station in Korea.

The Korean Ministry of Communication has requested that a reciprocal licensing operation agreement between Korea and the USA be developed. The MOC has asked the Korea Ministry of Foreign Affairs to request the agreement.

The Ministry of Foreign Affairs will note the conclusion of such an agreement on government information bulletins. The callsign prefix for reciprocal licensees is now under study. It is hoped that this agreement will be concluded by October 1990.

Special callsign. I shall be operating under a special callsign for myself, either 6K3ØAP or HL3ØAP, from September 1 to December 31, 1990 for commemoration of my amateur radio station's 30 years of operation and my 60 years of age. I will be operating on all WARC bands and modes, and will be issuing a special QSL card for this special callsign operation.

Korean nationals became able to get on the air in September 1960 with HM individual callsign, not a club callsign. I got my call HM1AP in December 1960 and received HM9AP as a mobile call in January 1963. Korea Amateur Radio League (KARL) Headquarters received HM9A. Now I am the oldest individual call holder in the Republic of Korea and a charter/life member of KARL.



SPAIN

Woodson Gannaway N5KVB/EA
Apartado 11
35450 Santa Maria de Guia
(Las Palmas de G.C.)
Islas Canarias, Espana

Hello to all from the Canary Islands. Some very nice news this month from the mainland and a few short "odds and ends."

I didn't make it to Rumania this year as I had hoped, but will attempt to put it back in my plans in the future. I am getting interested in experimenting again and that is likely to produce some QRP activity from my QTH. Lastly, the price for a temporary /EA license in Spain went down this year to 1000 pesetas (US$10). This license is still good for a calendar. And now to the mainland.

Hello from mainland Spain. I am NP4NQ/EA7. I am now at the Naval Base in Rota (Cadiz). I've been pretty active on 10 meters and 2 meter FM DX. That's all the equipment I have now.

We have at least 6 more hams on this base, with a few Spanish workers that are hams as well. It is kind of hard for the active-duty Navy personnel to dedicate all the time we would like on our hobby, but we still get on the air. On 2 meters FM I have talked to the Canary Islands, Morocco, Portugal, and a little DX in Spain. I find it fun since I don't have a SSB/VHF rig with me. There are a few contests *[contesters?]* on this mode around here, like ED7TDP in Cadiz.

We, the hams in Rota (both US and Spanish), would like to say that amateur radio is alive and well in the naval base of Rota. It is just like an extended DXpedition. . . so it seems sometimes! I've been at it for almost 4 years, and I'm certainly glad to have brought this equipment with me. Our main contacts on the base are EA7CZR and EA7PS, our so-to-speak hosts, and in some instances, QSL managers. This speeds up QSL cards in Europe. The hams in the town are also very, vary cooperative.

I would also like to say "Hi" to all, from the hams here: NT8X/EA7, AA2AH/EA7, and myself NP4NQ/EA7. 73s and DX Amigo de Canarias! AT3 Jose A. Delgado (USN), Apartado 33, Box 10 (VQ-2), Base Naval de Rota, (Cadiz) Espana.

Number 38 on your Feedback card

UPDATES

Alinco DJ-500 Special

Like all companies, Alinco sometimes has specials. In the middle of last September, we received word that the Alinco DJ-500 dual-band handheld was sent to dealers as a promotional special with a 30-day warranty. An optional two-year warranty was available for a minimal charge (no more than $15). Except for this clearly marked special, the warranty information given in Gordon West's "Alinco Service Survey" in the September issue is correct.

JAN Crystals—Phone Number

From Bill Burdette of Burdette Marketing & Communications, Inc: "On page 20 of the August issue, you published our telephone number instead of the number for JAN Crystals. While we are the advertising agency for JAN Crystals, we would appreciate it if you would advise your readers to contact JAN Crystals directly, at (800) 526-9825."

JA8IJY G3 FAX Controller for Ham FAX

From David Cowhig WA1LBP: "Here are equivalents for the Japanese ICs used in the JA8IJY FAX modem for hams described on page 24 of the May 1990 issue. IC 2072D is the one-chip VOX IC NJM2072 from Shin Nihon Musen (JRC Devices). IC 78L05 is a three-terminal series regulator (rating 100 mA at 5 volts max) for a power supply made by many companies, such as TI and Motorola.

"I got this info from Japan through JUNET, a Japanese language e-mail conferencing network analogous to the USENET, accessible worldwide through many networks. Thanks to OHO Kazuhiko of the Packet Radio User's Group, CHIKARAISHI Hirotaka of the Tokyo Institute of Technology, and Jon Iza W1/EA2SN in Massachusetts for their advice.

"The author of the FAX modem interface, Mr. Fukunishi JA8IJY, welcomes questions. Send your letters with SASE to: Mr. Keizo Fukunishi, Migi 5, 14 Ichijodo, Asahikawa shi, Hokkaido pref., 070 JAPAN. Tel. Day: +81-166-24-2851. Night: +81-166-62-0526."

GM is Scotland

From Duncan Lindsay GM7CXM: "Your August '90 edition of Ham Help lists GM4PLM's country as England. This ignorance is expected from most Americans, but surely all you DX chasers know that GM is Scotland?"

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LETTERS

Number 1 on your Feedback card

From the Hamshack

Mike Wengert 9M8XX Have been active on 17m lately. Know what you mean about "contest-type" operation. Hate it! Everytime I get on, nobody wants my opinion . . . just my QSL card! Wham, bam, thank ya ma'am! The Europeans won't gimme a minute's peace. There are still a tew people who like to chat, but most are looking for a new country on a new band. Would like to get some middle and high school ham clubs going here, but licensing requires you to be at least 18 years old. Self-defeating, isn't it?

Considering that before the ARRL's Incentive Licensing debacle, 80% ol all new American hams were under 18, that's one way to keep Sabah from getting kids interested in high tech careers. . . Wayne

A Maine reader writes: K1MAN has been given a fine of $1,500 for "willful and intentional interference" by the Belfast (ME) FCC office! I like your articles about this BIG MOUTH. He does *nothing* for the area here in Maine; nor do we wanl him on our repeaters. We have NO USE for him in this area, and I am only some 35 air miles from him. Plus I belong to the Augusta Maine Amateur Radio Club, and we all feel the same about him. Please keep up the "good work." Nail him every chance you get!

Yep, it's a pity, Baxter's IARN is a worthwhile idea, and when not endlessly promoting Baxter, does some worthwhile traffic handling. But this seems mostly because the ARRL has so totally dropped the ball in providing needed emergency services. When St. Lucia was devastated by a hurricane a few years ago, the ARRL did nothing, so I sent a good operator down with a large suitcase of ham gear to help out. And help it did. Doesn't it make sense for the ARRL to initiate and coordinate emergency services instead of leaving it to chance? . . Wayne

Ozzie KA1BIK Wayne Green, "Never Say Die"—either this guy was just released from the institution or he is absolutely brilliant.

To attract new people to ham radio, you need to sprinkle "radio dust." I remember as a young boy about nine years old peering into the back of a radio and seeing the strange and magical glow from the glass bottles, and when I got my nose close enough, I inhaled "radio dust" and it went directly into my blood stream. Once in the blood stream, it's there for life.

Radio dust is a unique dust baked from the heal of the vacuum tubes and the aroma of melting wax from condensers and warm resistors. Il will hook anyone into the weird world of radio. Alas, there is no more radio dust; vacuum tubes have all but disappeared, and so have wax-covered capacitors. Wayne Green's idea for recruiting hams by audio visual methods is probably very good. Wayne, maybe I'll meet you on the air or in the institution.

Bill Wells N4VBK/AA, Atlanta GA As a 37-year-old entrepreneur in the computer business with almost two years as a licensed ham and ink still wet on my advanced ticket, I was appalled when I opened a letter from President Price requesting money to provide "special support" for representation at WARC-92. What kind of idiots do they take us to be? Better yet, what kind of idiots are running the ARRL?

It's time for the League to start spending our money more wisely. I saw the letter as nothing more than a self-ingratiating espousal of what President Price *hasn't* done, i.e., get new hams. The cost of mailing that letter to ARRL members could have purchased (at cost) a lot ol copies of *Tune in the World* for schools and clubs, which in turn would produce more hams. We, rank and file members of the ARRL, need your help in purging our directors.

I propose that you give a full page ad to anyone who runs against an incumbent director until the house is finally clean. Sure, it will cost the magazine a lot of money, but as you said, you've never lost enough money to put the magazine out of its misery.

Heck, I'll provide whatever space it takes to help get some new faces in the ARRL annual reports.

Alas, thousands of brain-washed members will get out their checkbooks and send Price money. . . Wayne

Delvin R. Bunton, Vancouver WA Wayne, I like your editorials. They make me think and take stock of my prejudices and cherished opinions. You've finally convinced me to change my priorities and get my license. I anticipate taking my Novice test soon and upgrading to Technician shortly after I get my license.

Even as a nonham subscriber tor several years (I think about 10), I recruited the local ham club (Clark County Amateur Radio Club) to set up a booth at several Boy Scout activities (which they did), but it didn't result in any new hams that I know of.

Over the years, I've attended ham club meetings where NO ONE came up to me (an obvious nonmember) and asked my name, interests, or anything else. Small wonder hamdom is dying off when potential new members are not welcomed in a way that encourages return visits.

Stephen Wimmer WU0F, Raymond NB Having been a service tech for nearly 12 years (I quit 3 years ago), I enjoyed Gordon West's "Service Survey Wrap-Up." I heartily agree with *1. Improve your correspondence.* A note that simply says "doesn't work" is a sure sign that the radio *does* work, and that the problem Is an accessory. Which brings me to a point I don't understand: *3. No accessories, please.* Too many times I have spent two or three hours on a radio because I believed the customer's note, only to find out later (when I finally got hold of the customer) that the real problem was the mike or some other accessory normally used with the radio. The really bad part about this is that I still have to charge lhem (my kids need to eat, too).

Next, I want to expand on *4. Better phone numbers.* Remember this country has four lime zones. Please give more than one number where you can be reached, and include the times you can be reached at which number, as well. If you use an answering machine, PLEASE play the tape back once a day. Also, it has also been my experience that answering services are even worse.

Steve Weldon N6PZV, 7J6CAR I just received your fourth notice lor not renewing my subscription. For the record, I have every intention of renewing my subscription as soon as I relocate in the states in a couple of months.

Most "junk" mail I receive gets thrown out before it's even opened, but a letter with "73" printed on it arouses my curiosity. Why? Because your editorials are interesting, to the point (most of the time), and generally right on the mark. I'm stationed in Okinawa, Japan where entertainment of any kind is greatly appreciated.

There have been many times when lellow hams have sat around their radios on a slow evening and had a lot of fun discussing your editorials. Sometimes when we don't receive our issues of *73* at the same time, entire quotes are transmitted on the local 2m/70m simplex frequencies. Believe me, most hams are extremely happy lo have someone with guts representing our hobby.

73 is the best ham radio monthly publication of its kind. There's really little debate on this between the 50 or so American hams stationed in Okinawa. *QST* is plain boring, but very informative on the political side of things, as well as giving current contest information I'm sure somebody uses. *CQ* isn't bad, but for the most part it seems to be put together hastily and without much of a plan. Kind of like someone decided at the last minute to put out a magazine. On second thought, I guess it is bad, sorry for lhe lapse. At least il isn't as dry to read as *QST*.

73, on the other hand, is a lot of fun to read. The magazine opens up with what we call "Crazy Green's" bitch session. Then you have "QRX," which keeps us abreast of the most current news in amateur radio (*QST* is normally good for the fine details), followed by a variety of interesting articles pertinent to the current generation of hams. Fox hunting, projects, equipment reviews, and "Ask Kaboom" are all interesting to read and informative.

My biggest complaint with *73* is all of the excellent articles on projects I'd like to build and reviews of equipment I'd like to purchase, with absolutely no verification from your staff. Let's lace it, mosl hams who submit articles are "amateurs" (pardon the pun) in the electronics field. We need input like this, but these guys make mistakes, heck even professionals make mistakes, and a double-check method is mandatory for almost anything in this area.

Having a member ol your staff assemble and build these projects and report on assembly, function, and relative worth, along with possible improvements, would be a major stepping stone in "professionalizing" these articles.

Next, *QST* provides the best equipment reviews in the business. You can always count on the same set of specs being tested on every radio. Sure, there is some good information in your articles, but they don't carry enough weight for me to make a purchasing decision. For that, I go lo *QST*.

Do I expect you to agree with me? Doubtful, as you seem to have already thought out most aspects of your magazine, and I'm sure the reason for my complaint is it just costs too much.

Thanks for your great letter. Readers' opinions and criticisms are important to us, especially when they're as well-stated as yours. Let me address your two main points: construction projects and reviews. Though many of our projects are submitted by "amateurs," the majority of construction articles we publish are written by professionals who have some connection to the electronics field. Your suggestion that a third party also build every project was greeted with enthusiasm by WB8ELK. Unfortunately, we need him to edit the magazine. We simply don't have the staff to re-build every project.

In the area of reviews, I agree that QST does a fine technical review. Why should we repeat their efforts? We want to give a true user's perspective in 73. You could call our review style a "field test" review. By doing this type of review, we feel that we add to the reader's information about a product, and provide a perspective that you can't get anywhere else. Once again, thanks for taking the time to write . . .

David N1GPH

As you say, even professionals make mistakes. Always check the "Updates" department for improvements, new information, and changes. That's what it's for. If you think there's an error in a construction article, get in touch with the author first, just in case. Send us a copy of your letter to the author so we can follow up on it. We check out all reports of possible errors. If you look over "Updates" for the past couple ol years, say, you'll find that there are very few errors in our construction articles. . .

Linda KA1UKM/KT

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Issue #363

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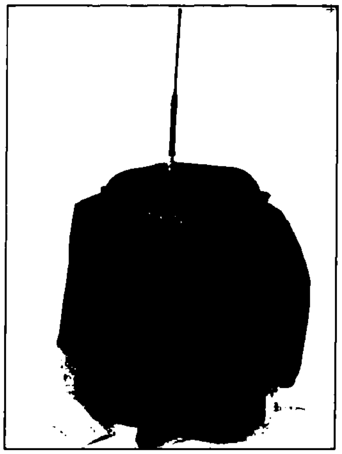

Take a hike! . . . see p. 9.

Cover by Alice Scofield

Cover: Operating portable packet from Monhegan Island, Maine. (l. to r.): Evan Cooke, Adam Cooke and Mike "Nuge" Nugent WB8GLO. (Photo by Henry Levy.)

DEPARTMENTS

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It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 17. You'll notice a feedback number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*.

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Number 2 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1

CQ Owensboro

Some interesting letters have come from Owensboro (KY) with shocking news regarding W4OYI, the ARRL director and his sycophant minions. Before I jump off the deep end I'd like to hear from other local hams and OARC members about what's been going on with the club and the incredible civil defense scandal. Names will of course be kept in confidence.

ARRL Bashing? Me? Forsooth!

A letter from a Novice mentioned something about me bashing the ARRL. . . and the president of his local ham club tearing up a letter from *73* in front of his club members. You can imagine what I think of this jerk.

Despite considerable pressure from some directors to get me to hang ARRL dirty linen out for you, I've tried to keep my editorial comments to ways to improve the League, not how to hurt it. I have little to gain from bashing the League and a lot to gain from improving it. This is my hobby too, you know.

The next time someone gripes about me bashing the ARRL you'll find that (1) I've been an active member far, far longer than he (or she) has (I have my 50-year pin, how's he doing?). (2) I've kept very close track of the League for the last 40 years and known most of the directors, the officers and the HQ people personally. (3) I've been more active in amateur radio than anyone else in the world, I believe. I say that from the viewpoint of the hamming I've done. . . such as DXing from over 50 countries, working via OSCAR, working 350 countries, pioneering RTTY, repeaters, NBFM, SSTV, and SSB; won Sweepstakes, VHF, DX and other contests; built my own gear for many years; worked moonbounce, seven states on 10 GHz from NH, been publishing ham mags for 39 years, FCC's NIAC member for years, founding member FCC's LRPC, represented US at ITU in Geneva, have addressed ham clubs and conventions all over the world, etc. So why is it out of place for me to make suggestions for ways the ARRL can be improved? Who better in the hobby knows?

I hear the inside dirt from disgusted ARRL directors. I've heard the FCC's side of everything for the last 40 years too, having talked with many of the Commissioners personally. I've regularly heard from disenchanted HQ staffers.

Do you suppose that the people in the industry know what's really going on? You better bet they do. And how many of them have you talked with confidentially? I know most of 'em personally and you'll get your eyes opened if you talk with some of them.

Now tell me this, what do you imagine I have to gain from bashing the ARRL? I've heard that this is supposed to sell magazines and that Wayne is out after the buck. I have never heard that from anyone with an IQ in three digits or who actually knows me . . . and I don't expect to. Bashing the ARRL does not sell magazines, it just makes blindly loyal members so angry they could spit. Non-members mostly could care less. There aren't many ARRL-haters. . . just mostly lovers who believe the ARRL can do no wrong . . . and then there are about two-thirds of the hams who really don't give a damn and really don't want to be bothered. Most don't read any ham magazines at all.

About Money

People who are hung up on money are to be pitied. I sure don't envy people who spend like Donald Trump. I probably spend less money on myself than most of you, yet I see ways to make money everywhere I turn. There are incredible opportunities, once you tune your mind to that wavelength. I could start at least one new, profitable business every day.

I'm an entrepreneur. Always have been. When I was 12 I started a mail order stamp business. If you read more than comic books and *QST* you know that entrepreneurs go into business for the fun of it and few, if any, are money-oriented. Oh, we know we have to make money or we go out of business, so we tend to make money. But the money is never the goal.

73 has lost a little money most, it not all, of the 30 years since I started it. Sure, I could set the ad rates higher and make a profit. . . or charge more for subscriptions. . . but as long as it doesn't lose a lot, big deal. I publish it because I enjoy it.

When I published computer magazines I put everything I made right back into starting more magazines and services. I published dozens of books, hundreds of programs, and seven computer magazines. Whenever it looked as if we might get some money ahead I'd start a new publication or service.

Now I'm doing the same thing again. I recently listed some of the new companies I've formed and am forming. There are even more now, with only our difficulty in finding people slowing us down.

I've enjoyed hamming for over 50 years and I'd like to be able to continue for what few years I've probably got left. But this means trying to get you to get the ARRL to do what needs to be done. Now tell me, do you honestly think my detractors know better what needs to be done than I do? Have they done their homework? I have.

And tell me again about how they say I'm just trying to get more *73* subscribers because of greed . . . and I'll think they are nitwits. My apologies to the other nitwits.

I suppose, it the current ARRL directors have their way and you don't replace them in the next election, I can always get started with some landline bulletin boards and Compuserve and get more involved with my Mac as a substitute. It won't be the same as working DX on 20m, but it'll be fun reminiscing about our hobby after it's gone.

Things can move fast these days. Look how quickly East Germany disappeared. And how fast the communist Eastern countries changed! The 1992 ITU conference will soon be upon us. There we will face pressures from every country in the world to give up our bands. Will we even have the support of our own government? How much would you like to bet?

Friends tell me my problem is that I'm too much involved with amateur radio. . . that I care too much. After all, it's only a hobby! Maybe they're right and I should spend more time on other things. . . like music and education.

Hold on, someone's calling me on the repeater. . . gotta go.

If You Were President. . .

Of the ARRL, not America. . . let's not bite off too much at once. Bush has his hands full with Iraq, the budget, the balance of payments, the S&L mess, the bank bomb (Third World loans), our education debacle and so on.

And we in amateur radio have a discouraging situation facing us. Here we are with large chunks of our spectrum allocations under siege from every quarter. What few of us are left are more involved with fighting each other than the enemy. If you are going to be anything more than a caretaker League president, arranging the deck chairs on the Titanic as we sink, you have an awesome responsibility. What would you do?

Spectrum needs are avalanching upon us. The Information Age means communications. We're talking tens of millions of personal telephones in shirt pockets, and that's just for starters. The next generation will be pocket personal communications centers that will allow us to talk, handle voice-forwarded messages, FAX, and even data and graphics. We're talking major spectrum needs, even with spread spectrum communications and data-compacting algorithms.

Our delivery giants such as UPS and Federal Express will want to be able to trace any package right down to the truck it's on. . . instantly. High definition television, digital sound, world computer networking, and hypermedia access all mean more spectrum needs.

What priority would you give a bunch of testy old codgers, mostly retired, almost none black or any other minority, not even many women. . . if you were going to be fair in allocating spectrum for them to while away their few remaining years instead of watching TV or playing golf?

You might want to listen and see what they're doing with the billions of dollars in frequencies they're using. Let's see now, their most important band, by far, is 20 meters. . . how's that doing? This is the band that a hundred Third World countries would give almost anything to use to broadcast to their expatriates and keep them in touch with their homeland.

You start at the low end of the American phone band and you hear the pileups. . . each with hundreds of crazed old men calling and cursing each other, trying frantically to get through to a rare one. You hear the California "kilowatts". . . which sound more like 50,000 watts, all calling endlessly so that no one can even hear the weak DX station. You hear catcalls. You hear frustration and anger, not people having fun.

The beleaguered DX operator has little control of the mess he has generated and no matter how he pleads for cooperation and a chance to actually talk with someone, the hordes are merciless. This is blood. This contact must be made. Just give me a signal report, never mind your damned name, you jerk. And break, break, who's your QSL manager again?

With a sigh you tune up the band. The next 50 kHz is full of chirping carriers. Slow-scan. Hmmm, pinup pictures from *Penthouse* and *Gallery*. And one chap with a computer typing at about three words per minute onto his slow-scan raster.

Continued on p. 73

QRX...

EDITED BY LINDA RENEAU KA1UKM

Radio Officers Needed

Radio officers are urgently needed! If you have a valid FCC radiotelegraph license with a 6-months endorsement (or one that has not lapsed more than five years), a U.S. Coast Guard license, and good health; and if you can accept an immediate sea assignment, contact Mr. Bernie Stoller of the ARA (a radio officers union) at (201) 795–5536. You can also obtain additional information from Mr. Chris Krusa, U.S. Maritime Administration, at (202) 366–5755 for referral to a shipping company. Assignment will be to a ship from the ready-reserve fleet. So far, due to the Persian Gulf crisis, 40 ships have been activated and more will be in the near future. TNX *W5YI Report*, Vol. 12, Issue #19. Also, see the article "Pack Your Seabag, 'Sparks,' " in this issue of *73*.

FCC Investigations

The FCC's Field Operation Bureau is investigating reports of interference with the TIKI distress call on the maritime net frequency 14.313 MHz on the morning of May 19. Any amateur radio stations with tapes of the incident are requested to mail them to Mr. John R. Hudack, FCC Room 744, 1919 "M" St., Washington DC 20554.

On another matter, the FCC has asked Glenn Baxter K1MAN to justify his practice of running taped "news" and bulletin transmissions without regard for QSOs in progress at the time the bulletins begin. The FCC also cited K1MAN for improper identification and running illegal phone patches.

Concurrently, it seems, K1MAN sent the FCC a notarized affidavit charging KV4FZ, who was in contact with WD4GDP, with refusing to relinquish 14.275 for emergency logistical Red Cross medical traffic with a station in Iran. The affidavit states there was malicious and intentional interference later the same day. K1MAN was quoted as saying that if the FCC doesn't take some of his recommended actions against KV4FZ, WD4PZT, and NR6X for repeated interference, he plans to take the FCC to the Circuit Court of Appeals in Washington DC. Since Baxter K1MAN, as the proponent of AM modulation, took the FCC through the courts to the Supreme Court, this may be no idle threat. TNX *B-N-T*, Vol. 18, Issue 9, and the *Balanced Modulator*, Vol. XXV, No. 9.

Do Not QSO Kuwait

A QSO with a Kuwaiti amateur could cost him his freedom or his life. According to a message issued last September by the Radio Society of Great Britain via its GB2RS broadcasts, under no circumstances should you hold a QSO with any station operating from Kuwait. This is for the Kuwaiti amateur's safety. The RSGB says that the Kuwaiti Embassy in London requested them to issue this bulletin to amateur operators worldwide. It is not known if the Kuwaiti ambassador to the U.S. made a similar request to the FCC or ARRL. TNX *Westlink Report*, Sep. 28, 1990.

Qaestionable Questions

Two questions in the outstanding pools may cause problems in future testing. The first is: *2H-1-4.1 What emission designator describes single-sideband suppressed-carrier (SSB) voice transmissions?* When this question was originally written, the answer was J3E, of course. But now that Part 97 has been rewritten, the answer according to the present wording of the rules is "sideband phone." Thus, the question now gives away the answer!

The second question is: *4AC-4.2 How much farther does the radio-path horizon distance exceed the geometric horizon?* This question was originally released in the fall of 1986 with this answer as correct: "By approximately 1/3 the distance." The distractors (wrong answers) included "twice, 1/2, and four times the distance," respectively. Having reservations about the answer, the ARRL asked their propagation technical advisor (not on the League staff) to look into the matter. He eventually determined that none of the answers were accurate. The Technical Advisory Committee for the Question Pool Committee advises that there is not a solid answer to the question in the first place. The committee believes at this point that the most practical way to handle both of these questions is to formally remove them from the question pool. TNX Western Carolina Amateur Radio Society/VEC Inc.

Solar Cycle 22

Recent activity suggests there's still some life left in Cycle 22. During the week of August 27, the solar flux index soared to a level of 317. The is close to the highest solar flux reading of 335, which occurred during the second week of July in 1989. The latest rise stayed above 300 for six days, and was accompanied by several massive solar flares.

Normally, a solar cycle lasts about 11 years. If the peak did occur last summer, as some suspect, that would put Cycle 22 on a 6-year schedule. But then again, since this is only the 22nd solar cycle ever documented, maybe we don't yet know what the "norm" is.

Propagation expert Jim Gray W1XU reminds us that sunspots have been observed and recorded for only 250 years, and the sun is several billion years old. Since even our best records reveal only the briefest instant in the sun's life, it's likely that we have a great many surprises in store for us regarding the sun's behavior. TNX *The Ground Wire*, Vol. IV, No. IX, and *73* "Propagation" columnist, Jim Gray W1XU.

Digital Audie

Canada has been testing DAB—wide-spectrum digital audio broadcasting. First reports indicate quality far surpassing FM stereo. Expert observers in a specially equipped minibus reported superb audio with no multipath distortion, even when traveling in downtown "canyons" and over steel bridges. Some of the passengers even suspected trickery, believing that there was a hidden CD player aboard the minibus.

The transmitter for the first round of tests was a 1 kW unit modified to operate on UHF TV channels 68 and 69. Many observers expect DAB to eventually replace both AM and FM broadcast stations in Canada, and perhaps the world. Canadian broadcasters are looking for American support at the 1992 WARC Conference for a proposed digital radio band. The desired spectrum would be somewhere between 100 MHz and 1.5 GHz.

It seems like everyone in the world is out to get more megahertz at WARC '92. Particularly worrisome to the ham community are technologies like DAB and High Definition TV, which require very big blocks of the spectrum. TNX *The LCARA Patch*, *AARCOVER*, and Miles Abernathy N5KOB for this information from *Radio World*, a magazine for commercial broadcasters.

Didah Publishing

Do you ever have trouble locating past articles in the ham magazines? Some of the *73* staff ran into Didah Publishing at the Deerfield, New Hampshire, hamfest. In *From Beverages thru OSCAR—A Bibliography*, Didah has indexed every article ever published in *QST*, *CQ*, *Ham Radio*, and *73 Magazine*. It also includes 10 years of *RadCom*. Updates are available every December. The entire data base is available on disk or microfiche. They also provide printed lists, one indexing over 3400 product reviews. You can contact Didah Publishing at P.O. Box 7368, Nashua NH 03060-7368. Tel. (603) 878–3628/883–5152.

TNX...

...to all our contributors. You can reach us by phone at (603) 525-4201 or by mail at *73 Magazine*, Forest Rd., Hancock NH 03449; and by e-mail on CompuServe ppn 70310,775, MCI Mail "WGEPUB" and the *73* BBS at (603) 525–4438 (300–2400 bps), 8 data bits, no parity, one stop bit.

Behold the BackPacket!

Go take a hike with packet radio.

by Jon Trent Adams NW6H

I'm an explorer, so I enjoy amateur radio partly because of the security and companionship it affords me when I journey out alone into the badlands of the Southwest. Whether I'm away from home for just a night, for a weekend, or for a week or two at a time, I always try to carry along some piece of equipment that will let me (or at least let me attempt to) communicate with local hams, or even with my friends back home.

Carrying a little HF rig around is possible, but stuffing a TH7DX and power supply into a suitcase is a bit difficult. The AC cord is always a bear. In the Southwest, at least, I can carry a VHF or UHF handheld radio that usually lets me communicate locally—and sometimes all the way back to Los Angeles.

Sometimes It Gets Lonely Out There

Not that I usually have very much to say—I'd just like to know if the house is still standing, perhaps try to set up a schedule on 40 meters with friends back home, or maybe yak, just for the novelty of it, from some remote, isolated slab of sandstone near Moab, Utah, or from atop a big block of ancient ocean reef in West Texas. Of course, underlying all these whimsical desires is the *true purpose*: To be able to provide reliable communications at a moment's notice from any weird location I find myself in.

What's the best way of doing this? I could carry a QRP 40 meter CW rig. I could set up a station in a hurry with a small 10 watt radio, a battery and a long piece of wire. Then, assuming that an operator can be found out there in the QRM and N to hear my weak station, we might be able to communicate. But I might not be able to work locally. I might not be able to battle the big guns successfully. I would have to be at the equipment when the messages came in and, of course, operate the equipment when a message needed to be sent repeatedly to get through the chaff. (I'd also have to bone up quite a bit on my decidedly poor CW fist and ear.) Not a good solution for my predicament.

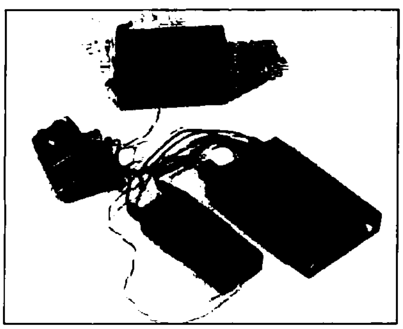

Photo A. The individual components of the BackPacket.

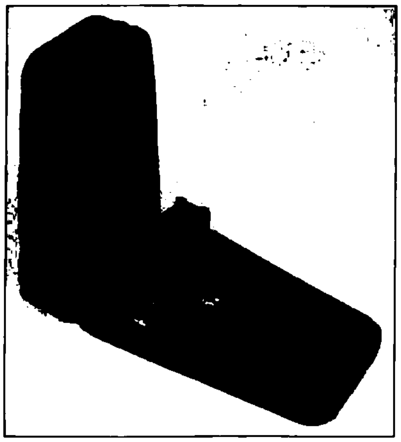

Photo B. Carving the foam for a snug fit.

Enter Packet Radio

Packet provides a mode of communications that is relatively automatic and error-free. Given that there are now packet radio digipeaters in most parts of the Southwest (even in the wilds of Springerville, Arizona, and Pecos, Texas) there exists (in theory) a possible method for me to get information back and forth between almost any two far-flung points. Since I picked up my first TNC, little more than a year ago, I have seen the activity on packet grow and expand into a somewhat viable network.

I needed a prototype mobile terminal to get into the system and test the concept. My first attempt was with an MFJ-1270 TNC. I bought a little Epson PX-8 laptop computer, complete with built-in telephone modem, tape drive, serial ports and RAM disk. In my truck I installed the TNC, a Yaesu FT-209 handheld 2 meter radio with mobile charger, and a quarter-wave mag-mount antenna stuck on the fender and dedicated to that radio. With a custom-made cable harness and dash-mounted interface box, I had a mobile packet station that allowed me to use either the handheld, low-power radio or the 25 watt mobile radio for the packet station.

There it was! My first mobile packet station (don't type while you drive)! A moderate success, limited only by the 5 watt output of the FT-209 and the horrible amount of 2 meter interference generated by the TNC. But I was able, in my short two week vacation through the Southwest, to keep in touch with the local packeteers and, occasionally, the hams back home. In fact, I generated quite a few of the local contacts (out there, local is within two hundred miles) simply by transmitting a beacon through the nearest digipeater with beacon texts like: "Hola from NW6H mobile on US 60 near Datil, New Mexico." It was like shooting fish in a barrel—I lured them in with those names of exciting, exotic places.

My friend Greg Noneman WB6ZSU was on vacation, driving from Los Angeles to Denver and back. He installed a similar station in his truck. With it (relying occasionally on 40 meters—at that time the packet digipeaters in New Mexico were few and far

Continued on page 12

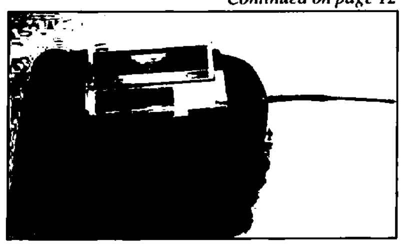

Photo C. Operating position when using the laptop computer.

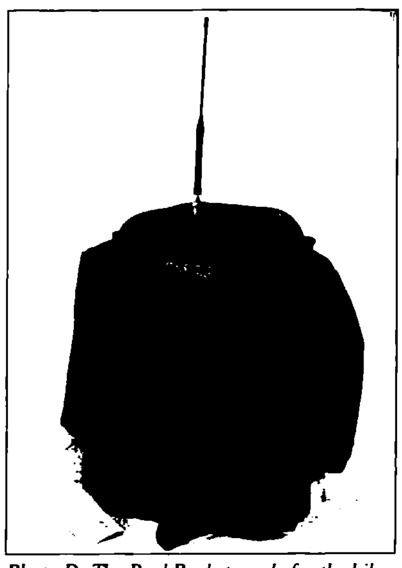

Photo D. The BackPacket ready for the hike.

Continued from page 9
between) he and I were able to leave messages with one another. We even scheduled a rendezvous in Roswell, New Mexico, at the local Dairy Queen!

This success spurred me onward. I was ready for the big time. By now, most of our little group of packeteers were packet-mobile, some always, others on an hour's notice. We decided to stretch our muscles.

The First Public Experiment

Our dedicated group of bit-bangers were invited by the organizers of the "Angeles Crest 100 Mile Endurance Run" to put together a packet radio demonstration by providing an alternate, redundant, and completely experimental route for important status and welfare communications for the nearly sixty runners in the race. This ultramarathon foot race was held in September 1987 in the San Gabriel mountains above Los Angeles. The packet stations, spread out over the course of the race, were set up to pass runner times and location information to our main database computer at race headquarters, where Search and Rescue personnel would be able to monitor the runners' progress.

I found that generally the information collected via our network was available at race headquarters more quickly via our fledgling packet network, set up that weekend, than when it was sent on the established voice network that we paralleled. Our system did not work perfectly, but at least it proved that the ability was there.

I called it another success. After the race, our group realized that what was really needed was a dedicated digipeater or two placed in ideal spots on isolated mountain peaks where there was no access except by foot. Perhaps we could also add a few terminals a couple of miles from any power or vehicular access. These devices would need to be robust, easily transportable, and fully self-contained. It wouldn't be easy to lug a bunch of radio equipment up a four-mile trail in a briefcase. It had to be packaged correctly.

Enter the BackPacket!

The BackPacket consists of a PacComm Micropower-2 TNC, an Epson PX-8 laptop, a Yaesu FT-203 handheld, a 7 amp-hour sealed lead-acid battery, all encased in a very sturdy Ensolite laminate in a JanSport day pack. The external pockets of the BackPacket hold antennas, connectors, chargers, extra cable, maps and other necessities. This is important because it lets you grab the bag in a hurry without having to remember all the little parts that usually get left behind.

When operating just as a digipeater it has a lifetime of nearly four days; when used as a terminal it has sufficient battery life for anywhere from one to three days, depending on the duty cycle of the terminal.

What is the most critical problem when attempting to assemble something like this? Number one on the list is RFI—radio frequency interference! Let's face it—the digital world and the analog world (TNCs, laptop computers and radio transceivers) are quite incompatible. The common cure for RFI complaints involves bypassing and shielding. When that doesn't work, the next step is to put separations between the interacting equipment.

The first two methods can help some, but the shielding can add extra weight, something I don't need here. Separation is an impossibility because of the already-defined space of the day pack. The only other possibility is orientation: sometimes a few extra dBs can be squeaked out there.

Constructing the BackPacket

The BackPacket's components are encased in a laminated sandwich of Ensolite, the material used for sleeping bag pads. This material is a ½ inch thick closed cell, dense, flexible foam that is available from most camping supply stores and is used to pad hips and shoulders when used as a sleeping pad. It also provides excellent protection for the laptop, TNC, radio and battery.

My first step was to find a proper pack. I spent several weeks lurking around the various backpacking shops in Los Angeles, attempting to find a sturdy, durable bag that not only had enough physical volume to hold the parts but also had external pockets, gussets and other widgetry so that all vital accessories could be carried as part of the package.

Unfortunately, almost all of the bags I looked at weren't designed for my purpose. (Don't these guys ever think of carrying a laptop computer and a 15-pound battery around?) I considered briefly, then discarded, the idea of building my own custom bag. I also looked at the plethora of camera bags. Most of these were not deep enough to hold the computer, and all were frightfully expensive. (I figure that the camera bag manufacturers know that you've gotta be rich to buy these fancy modern cameras.) Also, a back-borne bag would be easiest to carry and would leave my hands free; a camera bag flops around too much. I realized that most bags would require extensive modification to suit my needs.

I finally found a reasonable bag made by JanSport: the Super Sack. This bag had just enough internal volume to hold all the required equipment and not much more. At the least-protected points there would be no less than a half-inch of foam between any component and the outside. The bag is made of Cordura, a very tough, heavy nylon weave. Leather gussets and bosses are sewn on the bag at various places as attachment points and there are two long vertical pockets aside the main pack body. The entire base of the bag is made from a single piece of heavy, top-grain cowhide. It looked like a very durable bag. So, it came home with me.

I needed a template showing the internal shape of the bag. The pack body itself is somewhat tear-shaped. I made a rough measurement of the interior, cut a piece of heavy cardboard slightly oversized, then, through successive fittings, pared the cardboard down to size.

Using the template, I cut 12 pieces of Ensolite in this shape. At one half-inch per piece, 12 pieces stack up to provide a six-inch block of Ensolite sandwich. This stack of foam fits quite well into the bag volume, with little gap.

Next came the hard part: laying out the individual components, routing the cabling, and cutting out spaces in the Ensolite. I began with a single piece of foam as the base layer. This provided a minimum half-inch of foam between my back and any component in the BackPacket. On this layer I organized the TNC, battery and radio. I drew the outlines of the components on the surface of the succeeding foam layers, and proceeded to cut out two pieces of foam with those exact cutouts. (A new X-Acto blade will last about two minutes in this service; be prepared to change the blades regularly.) These fit snugly on the bottom piece, with the individual layers of foam cemented to one another using standard contact cement. Layers six through twelve were cut to house the battery, computer and control panel. I used this same construction technique to build up the full six-inch height of the foam block. The block breaks open between layer three and layer four to provide access to the radio and TNC.

Once the components were in place, I built shielded cables and carved channels in the foam to accommodate these interconnects. I used shielded cables and metallized cable hoods wherever possible to keep the installation electrically clean.

The TNC, radio and battery base are located at the bottom of the foam stack. On top of the TNC and radio, separated by another half-inch of foam, rests the Epson laptop. The final foam layers surround the laptop and the rest of the battery. Two cutouts of foam protect the top of the laptop when the BackPacket is in transit.

I built an interface panel to control the whole thing. I brought out the antenna connector to an accessible point, away from the buried radio. I routed the audio output from the radio so that I could listen to the channel. In addition I installed power connectors to charge the battery, and charge the laptop off the main battery, as well as fuses and power switches to protect the whole thing.

A cast metal Budd box serves as the mounting plate for all this hardware. A one-inch speaker and a toggle switch provide channel audio when required. A simple one-resistor charger supplies current to the laptop when needed to charge the computer battery.

Finally, a jumper cable routes the antenna line from this interface panel to the antenna mounting plate at the top of the BackPacket. I cut a bracket of 0.062-inch aluminum that rests between the top of the Ensolite laminate and the packcloth. Gravity holds the bracket in when the BackPacket lies flat; when in transit, the two closure zippers on the main bag hold the plate in, but still allow the antenna connector to project out of the bag so that you can connect either an antenna cable or a rubber duck antenna.

Accessories

The BackPacket still needed some acces-

sories. The laptop, and to a much lesser extent the TNC, generated a great deal of RF noise. This caused a very high receiver noise level in the radio, located no more than an inch or so from either. Moreover, when a rubber antenna was attached to the connector at the top of the BackPacket, the noise level climbed quite high. At this noise level it required signals of many microvolts to produce readable packets. I needed a transportable, easy antenna that was also very durable.

I built a simple rope dipole. Starting with 20 feet of RG223 cable, I stripped off 19 inches (quarter-wave at 2 meters) of the shield from one end of the cable. Then I slipped on a 19-inch piece of braid over that end and slid it down so that it formed an electrical dipole, with the outer jacket of the cable forming an insulator between the coax shield and the added braid. Liberal use of polyvinyl tubing and heat-shrink polyolefin tubing sealed the whole antenna and made it quite durable. A rubber ring eye at the end of the dipole provided a hook for hanging the antenna from a branch or rope. A BNC connector at the other end completed the antenna.

I needed a wall charger for the main battery, various adapter cables and connectors for a variety of installations, a TNC instruction book, plus writing instruments and paper. I also packed a clip-on, battery-powered reading lamp with a gooseneck so that the LCD screen could be read in the dark. The lamp also provided enough illumination to work the keyboard well. A magnetic-base mobile 2 meter quarter-wave antenna completed the suite. All these accessories were packed in a couple of nylon stuff sacks to keep the small parts from wandering away.

Final weight of the BackPacket, with all accessories included, is about 25 pounds. However, since it is carried on the back, it is a minor encumbrance: the most important thing is that it can be counted on to work and work well in almost any environment or location.

Future Plans

Future modifications to the unit may include some sort of LCD meter that indicates battery voltage. Also, it would be handy to know if someone has connected to the BackPacket even with the computer off. I can achieve that either by building a small circuit within the TNC that will generate an audio beep tone on the local speaker, or less invasively, by constructing an optically-coupled sensor that monitors the status of the CONNECT lamp, and generates the same beep tone if the lamp lights up. In addition, I'd like to try some of the latest micro-size TNCs and miniature HTs now available. This would certainly help to reduce the current drain and overall weight of the system.

But for now, the BackPacket, along with a suitable digipeater, provides an excellent and reliable communication method anywhere that I can hike, climb or bike. ■

Jon Trent Adams NW6H, 1139 S. Truro St., Inglewood CA 90301.

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

Feedback# Title
1 Letters
2 Never Say Die
3 QRX
4 Behold the BackPacket!
5 Ham Profiles
6 Upgrade Your HD-4040
7 Review: Ten-Tec Hercules II
8 The VOX Plus
9 Review: Lightning Bolt Dual-Band
10 Review: PacComm PSK-1
11 Pack Your Seabag, "Sparks"
12 Review: ICOM IC-726
13 Dealer Directory
14 RTTY Loop
15 Looking West
16 Hams with Class
17 Homing In
18 Updates
19 Audio Powered Tape Recorder Controller
20 New Products
21 Above & Beyond
22 Special Events
23 Ask Kaboom
24 QRP
25 1990 Annual Index
26 Ad Index 12/90
27 ATV
28 73 International
29 DX
30 Barter 'n' Buy
31 Hamsats
32 Random Output
33 Propagation
34 Review: PT-340 Tuner-Tuner

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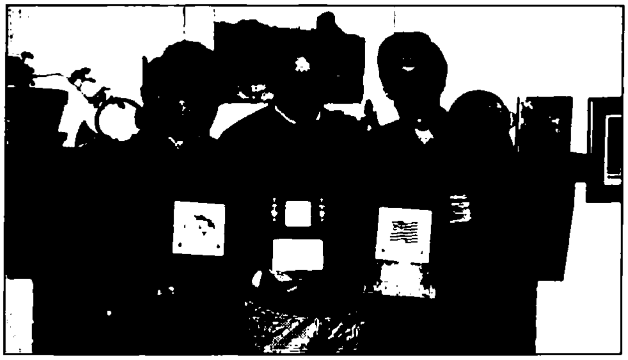


Photo A. Left to right: Gena UA9MA, Chuck (Charles Emily) W1NW, and Serg UA9MC, visiting W1NW in November 1989. They are holding trophies W1NW 5BAND DXCC, 5BAND WAZ, 5BAND WAS.

Greetings from West Siberia

Gennady Kolmakov UA9MA writes us that he found out about amateur radio when he was a freshman in the Institute of Railroad Engineers in 1972. At that time, there was an active collective radio station, UK9MBA, at the institute. He soon received his personal call, UA9MAF, and he built his first directional antenna. Since then, his main interests have been DXing and contesting. In the near future, he plans to learn about RTTY and packet.

Olga, his wife, doesn't share his interest in amateur radio, although she accepts his hobby with respect and understanding. But his sons, nine-year-old Mike and six-year-old Alex, are successfully studying CW.

Besides radio, Gennady is interested in music. He likes all kinds of American contemporary music, such as all forms of jazz.

Currently, he is vice-president of the West Siberia DX Club and he spends much time doing the administrative and organizational work. In particular, he's arranging a DXpedition to one of the far regions of the U.S.S.R. He's also QSL manager for radio stations 4K2OIL, 4K2BDU, 4K2OKV, 4K2BAZ, and 4K4AB.

"I'd like to use this occasion to send through your journal my warmest wishes to all American ham radio fans. I'd like to hope that radio helps people of our planet to understand each other better and bring peace to the world." *TNX, Gennady, for your greetings and wishes. Also, thank you for sending examples of the beautiful awards of the West Siberia DX Club, which we were happy to publish in "73 International" from October 1989 until the summer of 1990.*

Photo B. Off to a good start, six-year-old Terry Van Sickle KB5NTC plans to get his Extra in a few years.

Going Far—Fast

The Plano Amateur Radio Klub (PARK) congratulates Terry Van Sickle, son of Brenda N5LEU and Terry Sr. WB5WXI, on passing the Novice Class amateur radio exams last August. Six-year-old Terry had been studying in a class taught by Tad Derx N5ODR. The class, sponsored by PARK, had 45 students!

Since Terry KB5NTC couldn't write fast enough to copy Morse code by hand, he passed his code test by typing the code test portion on a laptop computer.

Terry is a first grader at The Greenhill School in Addison, Texas. He's interested in learning how to work amateur satellites. He hopes to have his Extra Class by the time he's 10 or 11. *TNX John T. Beadles.*

Photo D. Steven O. Sellers N5GZP wins journalism awards.

From Interest to Career

Licensed as an amateur radio operator at the age of 12, Steven O. Sellers' interest in the hobby led to his first job—in broadcasting at a small, local station in his hometown of Kenedy, Texas, when he was 15.

Steve N5GZP is active on 10 meters. He's a member of TEN-X International, the ARRL, and the Palomar Amateur Radio Club in the North County region of San Diego.

Recently, United Press International presented Steve with two broadcasting awards for two radio documentaries he produced and reported. The awards were for best investigative documentary in the Western Region and outstanding achievement in reporting in the Western Region. *TNX KGMG-AM/FM.*

Let's Talk!

Bob Weinstein KE2FE, assistant principal of Richmond Hill High School, says that these high school students love to talk with other high school students and they QSL "100% directly." They rapidly become disenchanted when all they get is "59 old man, QSL via the bureau . . ." during contests. To Wayne, KE2FE says, "I really agree with your idea about limiting credits for DXCC to certain contest dates."

Photo C. Bob Weinstein KE2FE (far back, on the right) and his class of high school hams.

Upgrade Your HD-4040

KISS your Heath HD-4040 and keep AX.25 too!

by Mark Dieter N2BLI

I was in the mood to try something new. I had a copy of KA9Q's Internet package for my Macintosh, but my old TNC would not support it (it requires KISS). I didn't want to invest lots of money in a new TNC, and I knew a KISS upgrade would not allow me to use the TNC in normal AX.25 mode. I have an excellent terminal program that would be useless without a full-function TNC. I wanted both, and I didn't want to spend any money. Sound familiar? So I put the little gray cells to work and this is what I came up with.

The KISS

KISS (Keep It Simple Stupid) provides direct computer-to-TNC communications using a simple protocol. Normal TNCs were designed to interface with humans, not computers. By designing the TNC for humans, it actually makes it harder to interface the TNC to computer applications. KISS removes many of those restrictions by placing most of the TNC functions within the attached computer. A KISS TNC only converts between asynchronous data for the computer to synchronous HDLC (High Level Data Control) for the radio, and it controls the transmitter. This allows the computer to maintain multiple connects, run new protocols, and other advanced functions. Some software packages like bulletin boards, TCP/IP (the KA9Q software), and others require a KISS TNC.

The TNC 1 KISS upgrade from TAPR consists of a single EPROM. It costs about $12. For normal installation, the new EPROM would replace the existing EPROM at hex address $E000. That's U12 in the Heath HD-4040. If you replace that EPROM with the KISS one, your TNC will work fine in KISS mode. It's not even necessary to remove the other original EPROM chips. The TNC will ignore them. Of course, your TNC will not be able to operate in its normal AX.25 mode. But remember, we're not willing to give up our normal TNC functions for a KISS!

Making It Work

What if we could mount both EPROMS in the TNC? Then all we have to do is find a way to switch between the two EPROMS, right? Lucky for us there is already a socket in the TNC for an additional RAM or ROM chip—U8. So mounting the new chip is easy. But these EPROMS have 28 pins. How can we switch them all? The answer is: We don't have to! All the address, data, and control signals, except one (more about that later), are the same as U12. The only problem left is that the starting memory address of U8 is 4000. The KISS EPROM must be installed at address $E000.

All devices that communicate with the microprocessor have specific addresses assigned to them. The address decoding circuits ensure that the correct device is "enabled" when it is addressed by the microprocessor. Each ROM chip makes up one 8-kilobyte segment of the entire memory. The starting address of each chip (8-kilobyte segment for ROM) is determined by the address decoder U4. This IC decodes the high bits of the address from the microprocessor and produces a chip select signal to the memory device that holds the particular memory location the microprocessor wants. The chip select "enables" a particular memory chip and

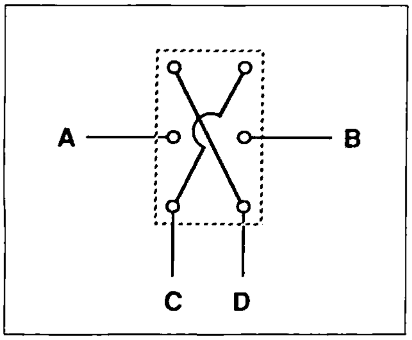


Figure 1. DPDT switch wiring details.

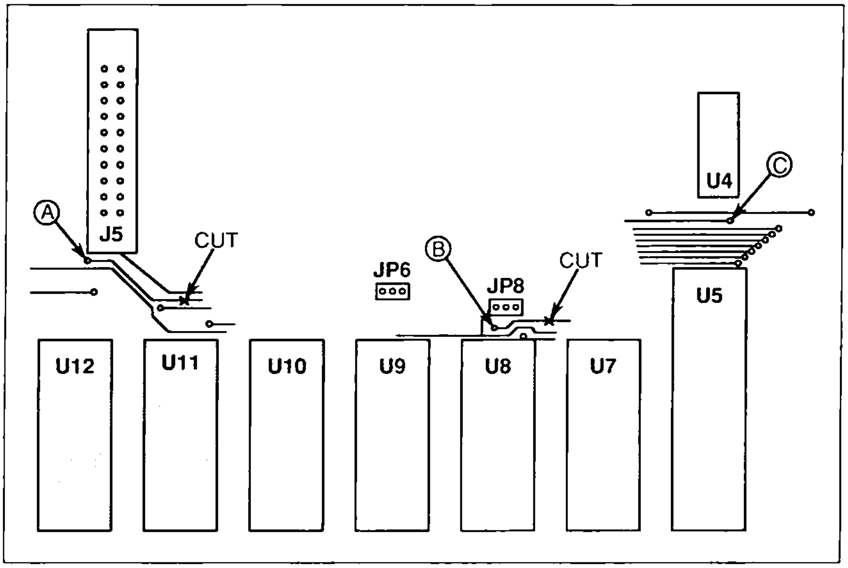


Figure 2. Location of wires A, B, and C on the TNC 1 circuit board (wire D connects to the 5 volt bus).

Photo A. The Heath HD-4040 TNC.

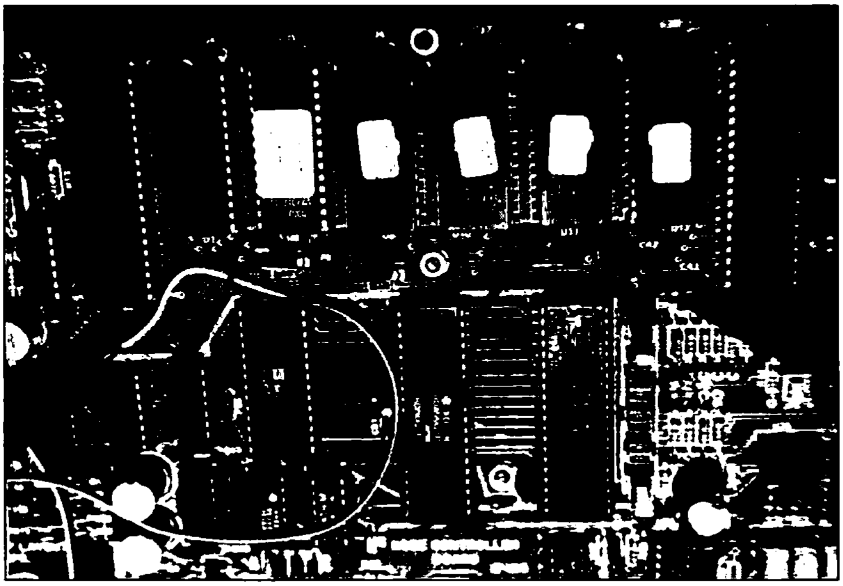


Photo B. The insides (note jumper wire locations).

allows it to react to the address, control, and data signals from the microprocessor. Essentially, it turns the chip on or off. Remember, I said there is only one signal that is different between U8 and U12. Yep, you guessed it! It's the chip select.

What we want to do is re-map the starting address of chip socket U8 (starting address $4000) to U12 (starting address $E000). This can be done quite easily by connecting the chip select signal for U12 to the chip enable pin on U8, then cutting the normal chip select traces from U4 to U8 and U4 to U12. The chip select of the unused EPROM must be tied to +5V. This effectively disables the chip and removes it from the circuit.

By doing this we can make U8 have a starting address of $E000, and we can disable U12. If we take the chip select signal for U12 and switch it between U12 and U8 (and switch the unused chip to +5V) we can switch which EPROM is seen by the microprocessor at address $E000.

So it turns out that we only need to switch one signal, the chip select. When we flip the switch and toggle the address $E000 between socket U8 and U12, we toggle between KISS and AX.25 mode.

Installation—Step by Step

Very few parts are required to install this upgrade in your TNC: the TAPR KISS TNC 1 EPROM, a good quality DPDT switch, and a few strands of small-gauge wire (ribbon conductor works great).

In the following instructions I will be referring to positions on the TNC circuit board. It is important that we have a common reference to locate items on the board. All my instructions will refer to the board, looking at it from the component side, with front toward the front of the cabinet (LEDs are mounted in the front of the board).

First, open the HD-4040 case. Find a spot in the case to locate the DPDT switch. Make sure it will clear the board and all components. I put mine in back near the power regulator.

Second, remove the circuit board. When you make the hole for the switch you will be making lots of aluminum filings which could short components on the board. To remove the board you must remove seven nuts holding the board in, and unplug the 7-pin power plug J4. Gently pull the front LEDs back to clear the case.

Next, put a hole in the case for the switch. Depending on the size and type of switch you have, the method will vary. Then reinstall the board into the case.

Locate U4, U8, and U12. Everything should be marked on the circuit board. Carefully install the TAPR TNC 1 KISS EPROM into socket U8. The notch end should match the notch shown on the circuit board. Make sure you do not bend any of the pins!

Solder four 9-inch wires onto the DPDT switch, as shown in Figure 1. Mount the DPDT switch into the case. Insert wire "A" into the hole in the circuit board, near the front left corner of J5, and solder. (See Figure 2.) Take your time—the hole is very tiny.

Insert wire "B" into the hole in the circuit board direcdy forward of the left-most pin of JP8, and solder. Insert wire "C" into the hole forward of U4 slightly to the right of its centerline (it's the closest hole to U4 towards the front), and solder.

Insert wire "D" into one of the holes in the +5V bus (on the front right-hand side), and solder. Locate the circuit trace from U4 pin 9 to U12 pin 20. Since the board has traces on both sides it's not obvious. It is the same trace that wire "A" is connected to. (See Figure 2.)

Now, the tricky part. Take a very fine-tipped knife or scribing tool and cut the trace somewhere to the right of where wire "A" is connected. I found that a scraping motion was most effective. Make sure the trace is cut completely through.

Locate the circuit trace from U4 pin 2 to U8 pin 20. It is the same trace that wire "B" is connected to. (See Figure 2.) Cut the trace to the right of where wire B is connected. Place jumper JP6 to the right. Place jumper JP8 to the right.

Operation

With the upgrade in place, you're ready to try it out. Power-up your favorite terminal emulator and the TNC. If you don't see the normal welcome message from your TNC, power the unit off, flip the "Normal / KISS" switch, and turn it back on. One position or the other will be the normal mode. **CAUTION**: I recommend that you always turn the TNC off when changing the "Normal / KISS" switch. In normal mode your TNC should behave exactly as before, without so much as a changed parameter.

To try out your TNC's new-found capabilities, you will of course need KISS software. Unfortunately, TAPR did not provide instructions with my EPROM. I found out that the TNC in KISS mode is fixed at 4800 baud, 8 data bits, no parity, and 1 stop bit. Your KISS software is probably already configured for that setup. None of the normal TNC settings have any effect on KISS operation. Remember all those TNC functions are done in your computer in KISS mode. If you have the optional Heath HDA-4040-1 TNC status indicator, the indicator LEDs will not work in KISS mode.

Postscript

Unfortunately, this upgrade uses up the socket for additional RAM (I wasn't going to add more anyway), but nothing is completely free, right?

The KISS EPROM as well as the KA9Q Internet Software Package is available from TAPR. To get an order form write to: *Tucson Amateur Packet Radio, P.O. Box 12925, Tucson AZ 85732; (602) 749-9479.*

You may contact Mark Dieter N2BLI at 86 Hiddenwood Dr., Rochester NY 14616.

73 Review

by C. Drayton Cooper III, N4LBJ

Ten-Tec's Hercules II Model 420

Turn your rig into a 550 watt transceiver!

Ten-Tec, Inc.
Highway 411 East
Sevierville TN 37862
Phone: (615) 453–7172
Model 420: $1275.
Power supply 9420: $795.

Ten-Tec's new Hercules II solid state linear amplifier fills an important niche in the equipment line-up available to today's ham, and does it with elegance and technological appropriateness. I have operated the model 420, as the Hercules II is known at Ten-Tec, since March 1990, and it has performed up to specs every time I've turned it on. It is extremely easy to drive, requiring only 35–50 watts input to produce the full rated output of 550 watts. It is exceedingly quiet. It is, far and away, the simplest amplifier to operate that I've ever used.

The Medium Power Niche

First, a word about its power output capability. The 420 is not a classic "rock crusher." The ham who chooses the Hercules II should realize from the outset that this is a medium-power amplifier.

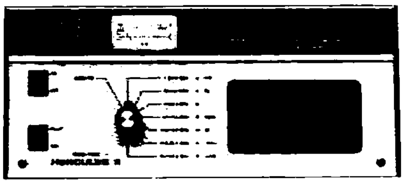
There is definitely a place for a medium-power amplifier in today's world. The rules and regulations we operate under stress the importance of running only enough power to maintain satisfactory communication. It's very difficult to run a 1500-watt amplifier at much less than full output without developing problems of reduced thermal efficiency in the final tubes. Generally speaking, reliable communications can be maintained at much less power than the maximum allowable by law. It should be noted that the difference between a 500 watt power level and the full legal limit of 1500 watts will only raise your signal a little less than an S-unit. That extra S-unit can be costly if you look at the price of a full-power amplifier.

Quiet, Easy, and Fast

For years, solid state technology has been portrayed as basically simple, straightforward, and highly reliable. Yet with a few notable exceptions, we have used the benefits of solid state technology only in QRP rigs and in transceivers up to the 100–150 watt class.

The Hercules II provides us with an opportunity to use the positive characteristics of solid state devices in a kilowatt-input-class amplifier. And the benefits are quickly recognizable the minute you switch on the 420. It is incredibly quiet, amazingly easy and simple to operate, and it provides instantaneous QSK, or full break-in CW!

Complete set-up of the 420 can be accomplished in about 15 minutes. Open the box,



take out the RF deck, make the three interconnections to the transceiver, screw in the PL-259 from the antenna, connect the power supply cable, and you're ready to operate. It's honestly that simple.

A No-Sweat Amp

Assuming you have an SWR of less than 2:1 on your feedline, you just turn it on and talk. There's no warm-up period, no waiting for capacitors in the power supply to charge up, no tube filaments to heat. And there's no grid drive to peak or final circuit to dip. If you're the type who enjoys fiddling with his gear, this may be disconcerting at first. But believe me, it's a welcome change after years of worrying about too much, or too little, grid current; about whether or not the final was loaded up "tightly" enough; or about a fatal parasitic wiping out a $200 tube!

Since the theory of how Ten-Tec achieves 1000 watts input with 12-volt transistors has been thoroughly covered elsewhere, I won't get into that. Suffice it to say that they do, and if something were to go wrong, the transistors would be much less expensive to replace than 50-volt models.

The 9420 Supply—Heavy is the Word

Another feature of the Hercules II that should appeal to many in today's space-conscious age is its size. The 420 takes up no more space in your shack than a full-sized transceiver. In fact, the Hercules II essentially matches the Ten-Tec Paragon or Omni-V transceivers for compactness.

To accomplish this, the RF deck and the power supply had to be separated, as in the tradition of the Ten-Tec Titan amplifier. Herein lies the only disadvantage that I have discovered in the system. Naturally, a power supply capable of providing enough current at 12–14 volts DC to run a kilowatt-input linear has to be *heavy*. Unfortunately, the 9420 supply is over the UPS weight limit and must be shipped separately from the RF deck of the amplifier. Larry Worth, Ten-Tec's service manager, told me that technicians at the factory have successfully run a 420 on a heavy-duty car battery and an automatic trickle charger. In some of their advertising, Ten-Tec suggests this as an alternate way of powering the Hercules II. It certainly would be a less expensive way to go.

However, my experience with the 420–9420 system since last March leads me to recommend biting the bullet and going with the complete package. As heavy as the 9420 is, it can be conveniently placed out of the way. Since it is controlled by the on-off switch on the amplifier, constant access to it is not necessary. Just put it where air can circulate around its heat sinks.

Incidentally, the 9420 is wired so that it can provide power for a 100-watt class transceiver as well as the 80-amp amplifier. Believe me, you don't have to worry about whether it's stout enough to handle both the amp and your rig.

Remote Control Feature

A final feature of the 420 should be mentioned. Ten-Tec designed the amplifier so that it can be fully remote-controlled. They provide a remote head for the unit, and you can connect the RF deck to the head with a 12-foot multi-conductor cable. The remote head, which contains all the function controls found on the front panel of the amplifier, including the LED-driven PEP output indicator, can be placed on the operating desk, and the amplifier itself can then be situated in any location the operator chooses.

This feature was originally designed so that the 420 could be operated as a mobile amplifier (RF deck in the trunk, remote head under the dash), but it may also be a valuable feature for anyone whose shack is small.

Since first using a linear back in the early '60s (a home-brew pair of 4-400s), I have sampled a variety of the breed. Each of them needed some degree of special handling to get it to perform up to snuff. Thus far, however, the 420 is the first amplifier I have ever used that actually feels and acts like an extension of the transceiver itself. In fact, using it makes me feel like I'm running a 550-watt transceiver.

The VOX Plus HT Accessory

Enjoy base station performance—with your HT!

by Mike Kossor WA2EBY

After a long, busy season of fleamarketeering, I managed to reallocate sufficient funds to finally invest in a 2 meter rig. With all the fine equipment available, the selection wasn't easy. I wanted a rig that I could take with me to hamfests, operate mobile, and use at home. The obvious choice? A full-featured handi-talkie, of course!

The handheld I chose was perfect for taking to hamfests. I added the optional speaker mike, plugged the external 12 volt DC power cable into the cigarette lighter jack, made a mounting bracket, and enjoyed excellent mobile operation as well. But when I tried operating the unit at home, it became apparent I was having to compromise.

Unhandy Talkie

During a recent VHF contest, I found myself joggling the HT, logbook, and pen, trying to log and call CQ. I did my best at making contacts running a mere 2.5 watts RF output. Being limited to a single mode, FM, took its toll on my score, since I was unable to make CW contacts worth bonus points. I did try operating MCW (Modulated CW) using the tone pad, but the battery started dying during the awkward QSO.

With the battery gone, and out of the contest, I had plenty of time to think about how nice it would be to operate VOX on the handheld, as I do on my HF gear. Logging would be so much easier. It would also be nice to operate MCW with a real key, and transmit the full 5 watt RF output available without having to worry about taxing the batteries to exhaustion.

It also occurred to me that an MCW mode would be especially useful to individuals with Technician Class licenses who only have FM transceivers. How could they upgrade without practicing CW?

My thoughts soon turned to action. My goal was to design an add-on accessory that could provide these desirable features, at a cost and complexity well within the realm of the average radio amateur.

Features of the VOX Plus

What evolved is the VOX Plus. This accessory uses the external microphone, speaker, and power jacks of a transceiver, and adds the features of VOX operation or break-in MCW. It uses a clean 800 Hz sine wave oscillator complete with sidetone. A programmable regulated power supply is also available to power transceivers requiring six to ten 500 mAh NiCd batteries, at full RF power output.

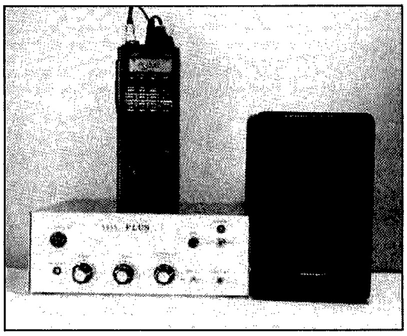


Photo A. The VOX Plus setup. (Photo by Eric Wagner.)

These features resolved the initial shortcomings of HT base station operation. However, since I was using an external speaker, I decided to add an active audio filter, too. This way I could separately adjust the low and high frequency response of the received audio. Compensating for poor frequency response of transmitted or re-transmitted signals, I could customize the received audio for optimum readability, and also use the filter to attenuate annoying CTCSS tones, if present. A 2 watt audio power amp was added to provide sufficient audio output.

One final feature I thought desirable was an audio tape interface for MCW. With this interface, taped bulletins or code practice can be sent with full break-in operation.

Circuit Overview

The VOX Plus circuit is a combination of transistor switches and common op amp circuits described in detail in many textbooks. Two good books on the subject are *Analysis and Design of Integrated Electronic Circuits*, by Paul M. Chirlian (chapters 13, 14 and 18), and *Basic Electronics*, by Michael M. Cirovic (chapters 14 and 15). The circuit does get a bit cumbersome when all the individual circuits are grouped together. However, Figure 1, a functional block diagram, should give you a general idea of how the system operates.

Referring to Fig. 1, VOX operation requires MODE switch S1 to be in the voice position. Switch S1A disables the MCW oscillator while segment S1B connects the transceiver's microphone input to the VOX Plus microphone amplifier. The circuit is considered to be in an idle state when the operator is not talking and the transceiver is not receiving any signal.

In this state, the positive input of comparator U2C is biased at 50% of the supply voltage, +0.5V, and the negative input is biased at +0.6V. The output of comparator U2C is low (0 volts) because the negative input is at a higher potential than the positive input. The re-triggerable monostable multivibrator (or "one-shot") is also in an idle or stable state with its output low because it has not received a positive trigger voltage from comparator U2C. PTT switch Q3, controlled by the one-shot, is in the open state, placing the transceiver in the receive mode.

Transmit Mode

When the operator begins talking, the voice is picked up by the internal VOX Plus electret microphone and amplified by U1A. The signal is then applied to the input of VOX amp U1B via switch S1B for further amplifi-

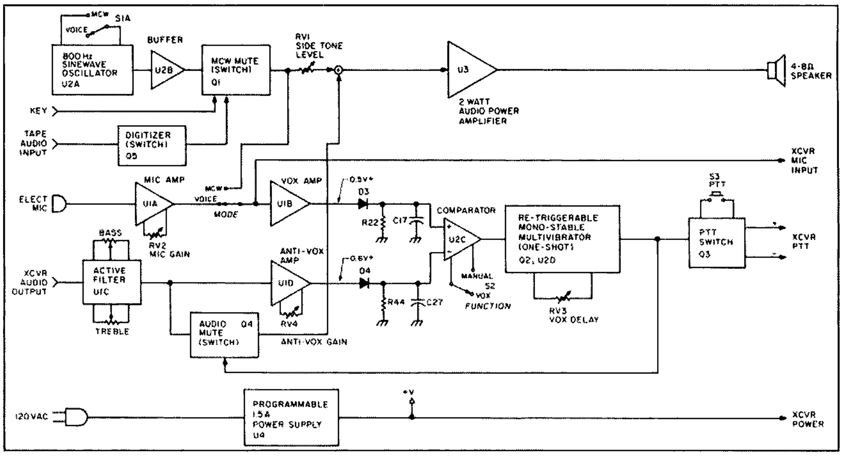


Figure 1. Block diagram.

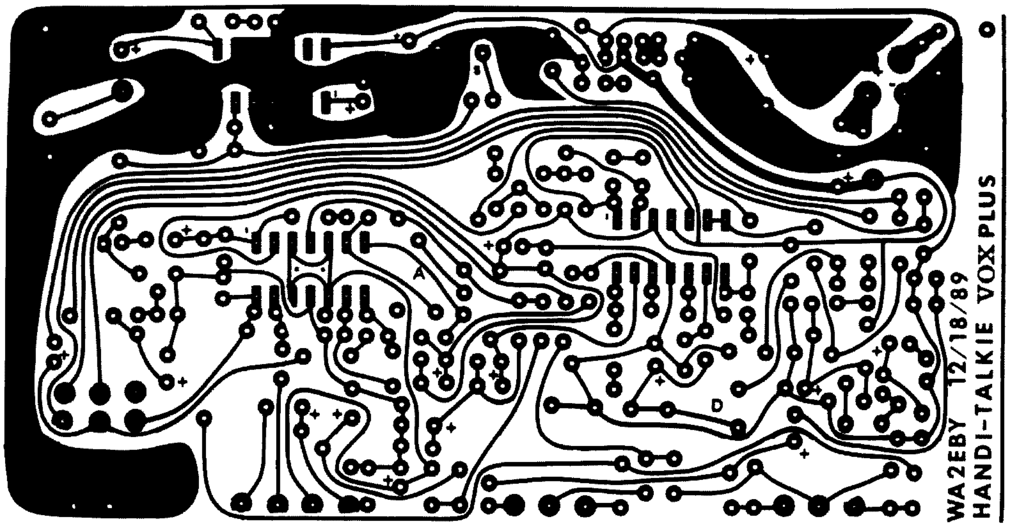


Figure 2. PC board foil pattern.

cation. The highly amplified voice signal at the output of VOX amp U1B is then rectified by diode D3.

The positive peaks of the rectified audio charge capacitor C17, which is connected to the positive input of comparator U2C. The +0.5V DC bias level normally present on the positive input of U2C increases in direct proportion to the amplitude of the operator's voice.

When the voltage level increases to about +0.7V, it exceeds the +0.6V value present on the negative input of U2C, and the comparator's output goes high (+V volts). This in turn triggers the one-shot and turns on PTT switch Q3, keying the transceiver. The output of the one-shot is also used to turn on audio MUTE switch Q4 to eliminate "pops" in the speaker when switching from receive to transmit and back to receive.

A sample of the operator's voice is fed to the microphone input of the transceiver and transmitted out. The transceiver will remain keyed as long as the operator's voice is of sufficient amplitude to keep capacitor C17 charged, maintaining the positive input of comparator U2C at a higher level than the negative input. When the operator's voice ceases, capacitor C17 discharges quickly through resistor R22, and the positive input of comparator U2C returns to its normal value of +0.5V.

Upon reaching its normal value, the circuit is back in the idle state, which causes the output of comparator U2C to return to low. Thus the trigger pulse to the one-shot is removed, allowing its output to return to low after a predetermined time delay set by VOX delay potentiometer RV3. PTT switch Q3 returns to the open state when the one-shot "times out," putting the transceiver back into the receive mode. If the operator pauses during his transmission and begins to speak before the one-shot "times out," the new positive trigger pulse from comparator U2C resets or re-triggers the one-shot circuit before it releases PTT switch Q3. The transceiver will drop out of

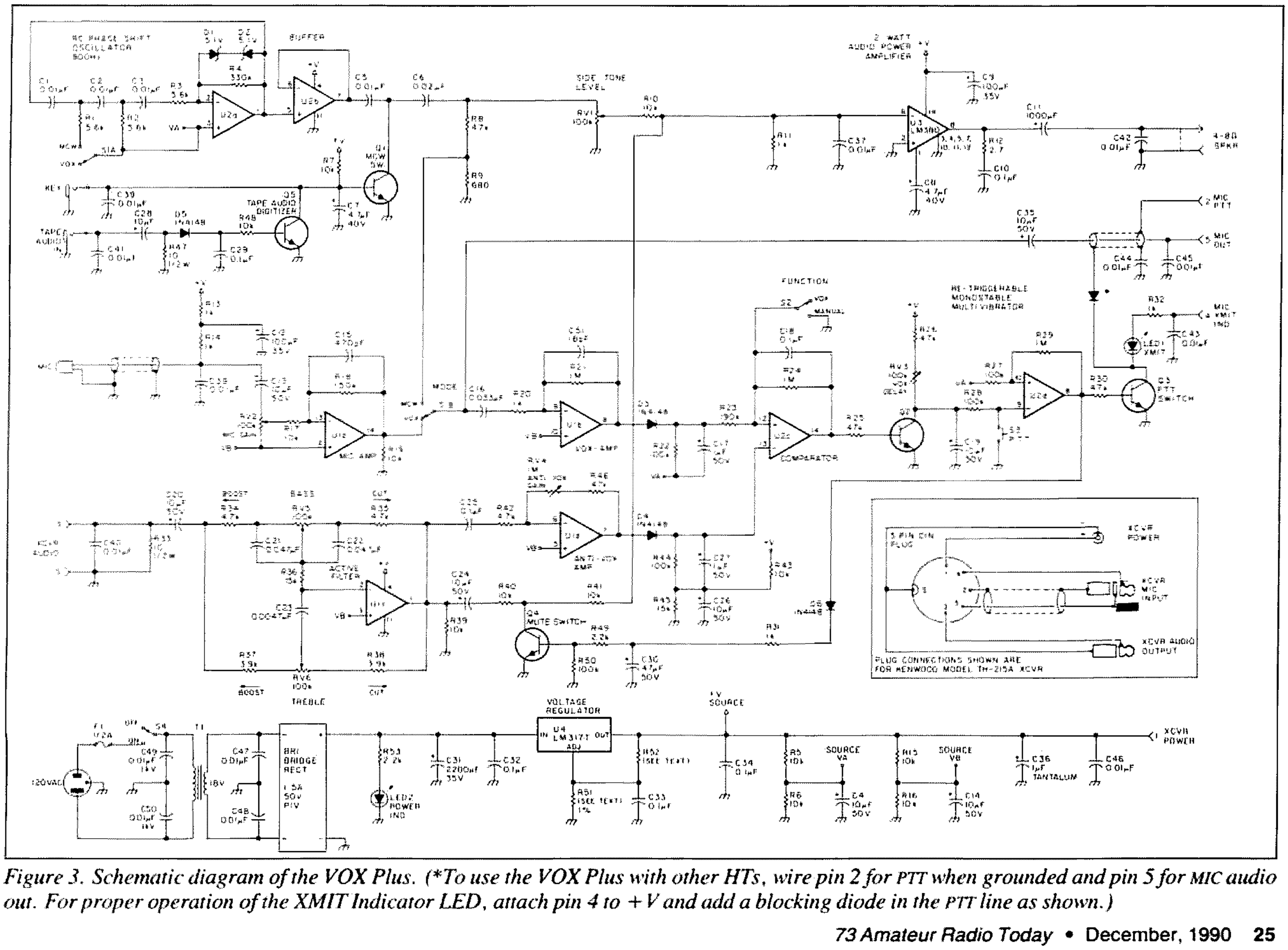


*Figure 3. Schematic diagram of the VOX Plus. (*To use the VOX Plus with other HTs, wire pin 2 for PTT when grounded and pin 5 for MIC audio out. For proper operation of the XMIT Indicator LED, attach pin 4 to +V and add a blocking diode in the PTT line as shown.)*

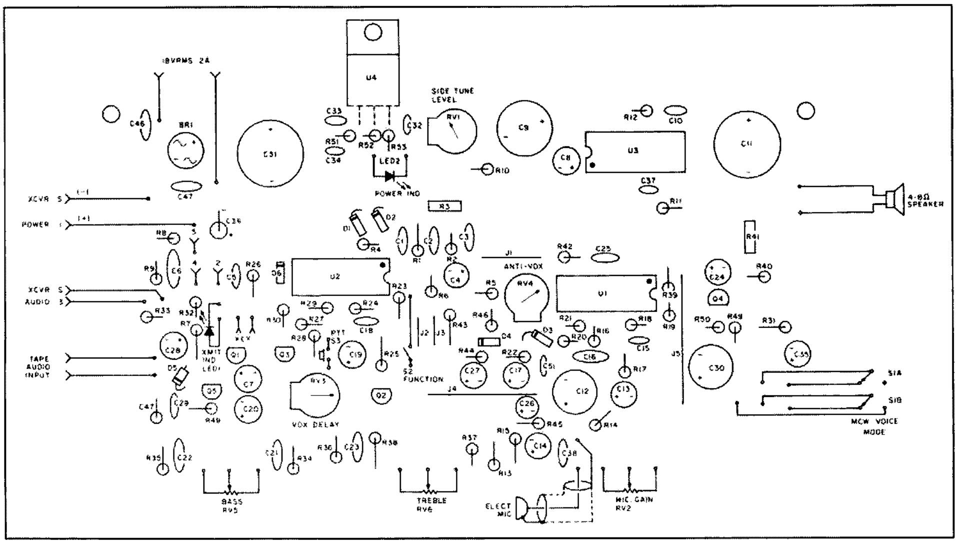


Figure 4. Parts placement for the VOX Plus.

transmit mode between words if the VOX delay is set too short.

Receive Mode

When the operator is not talking and an incoming signal is received, the audio signal from the transceiver is conditioned by active filter U1C, then passed to a 2 watt audio power amplifier capable of driving a 4- to 8-ohm speaker at a respectable level.

A sample of the transceiver's audio taken from the active filter output is used to cancel the effect of the audio picked up by the VOX Plus' electret microphone; this prevents the received signal from keying the transceiver. The transceiver's audio sample is taken from active filter U1C and amplified by anti-VOX amp U1D. Diode D4 rectifies the audio sample.

The positive peaks of the rectified audio charge capacitor C27, which is connected to the negative input of comparator U2C. The +0.6V DC bias level normally present on the negative input of U2C increases in direct proportion to the transceiver's audio. The anti-VOX gain, controlled by potentiometer RV4, is adjusted so that the bias level increase on the negative input of comparator U2C equals the bias level increase on the positive input.

The net result is that comparator U2C remains in its idle or low state because the negative input tracks the positive input bias level, and remains lower in level. The operator can still initiate a transmission by beginning to speak while an incoming signal is being received. The voice will cause an additional increase in the bias level only on the positive input of comparator U2C.

When the increase on the positive input of U2C exceeds the negative input, the VOX Plus will key the transceiver and operate as described previously. Resistor R44 is used to discharge capacitor C27 when transceiver audio ceases, returning the bias level on the negative input of comparator U2C to its normal value of +0.6V.

MCW Mode

MCW operation is selected by placing switch S1 in the MCW position. This starts the 800 Hz sine wave oscillator, U2A, which applies a sample of its output to the transceiver's microphone input and disconnects the internal electret microphone. Break-in MCW operation is identical to VOX operation, except the 800 Hz sine wave signal takes the place of the operator's voice. The presence of the 800 Hz audio signal at the input to the VOX amp is controlled by MCW mute, Q1. A key or keyer activates MCW mute Q1 and allows the 800 Hz signal to reach the VOX amp. The same process takes place as described for VOX operation, using the MCW signal instead of the operator's voice.

A second method of controlling MCW mute Q1 is to use an audio tape player. Code practice, CQ, or CW message is recorded on audio tape. When played back into digitizer Q5, on/off keying pulses are generated, which control MCW mute Q1. Note that since the tape audio only generates on/off keying pulses, no tape hiss, hum, or background noise is heard. Taped code is QRM-free

Table 1. Power Supply Voltage Programming Resistor Values

R51 (1%)	R52 (1%)	Output Voltage	NiCd Cells
4.7k	510	12.8V	10
3.9k	510	10.8V	9
2.2k	330	9.6V	8
2.7k	470	8.4V	7
3.9k	820	7.2V	6

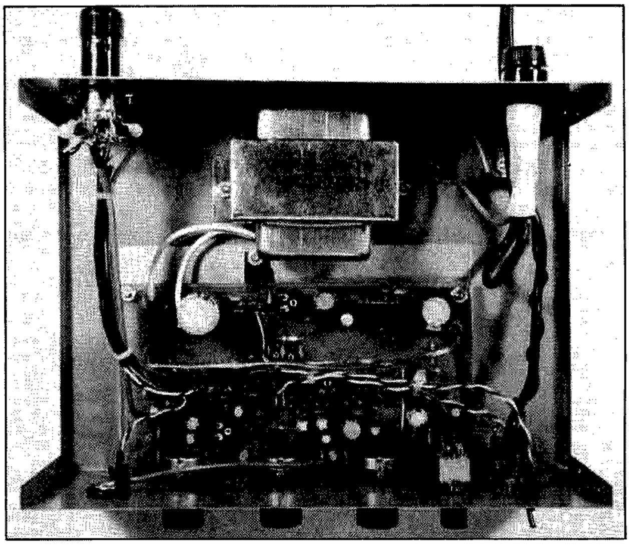


Photo B. An internal view of the VOX Plus. (Photo by Eric Wagner.)

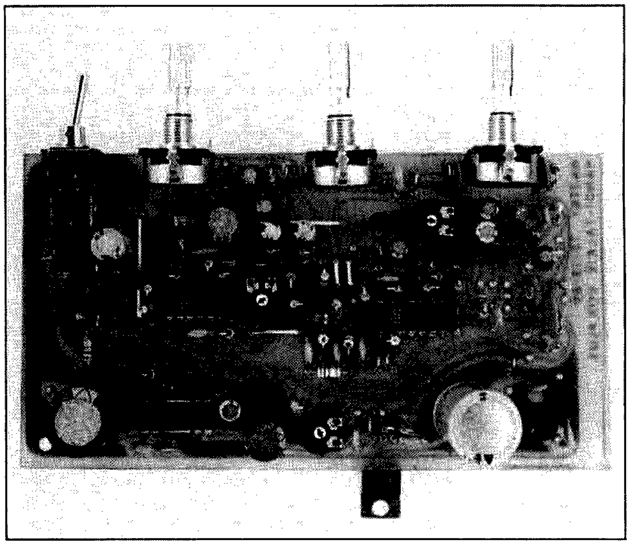


Photo C. Close-up view of the completed circuit board. (Photo by Eric Wagner.)

Table 2. Handi-Talkie VOX Plus

Resistors			
All resistors are ¼W, 5%, unless otherwise noted.			
R12	2.7	ohms	
R33,47	10	ohms	½W
R52*	510	ohms	1%
R9	680	ohms	
R11,13,14,20,31,32	1k	ohms	
R49,53	2.2k	ohms	
R37,38	3.9k	ohms	
R34,35,42	4.7k	ohms	
R51*	4.7k	ohms	1%
R1,2,3	5.6k	ohms	
R5,6,7,10,15,16,17,19, 39,40,41,43,48	10k	ohms	
R36,45	15k	ohms	
R8,25,26,30,46	47k	ohms	
R22,27,28,44,50	100k	ohms	
R18	150k	ohms	
R23	190k	ohms	
R4	330k	ohms	
R21,24,29	1	megohm	
RV1,3	100k	ohms	1 turn trimmer
RV4	1	megohm	1 turn trimmer
RV2,5,6	100k	ohms	linear taper pot
Capacitors			
C51	18	pF, 25V	ceramic disc
C15	470	pF, 25V	ceramic disc
C1,2,3	0.01	µF, 50V	ceramic disc, (NPO) or Mylar
C5,11,38,39,40,41,42, 43,44,45,46,47,48	0.01	µF, 50V	ceramic disc
C49,50	0.01	µF, 1 kV	ceramic disc
C6	0.02	µF, 25V	ceramic disc
C10,18,25,29,32,33,34	0.1	µF, 25V	ceramic disc
C16	0.033	µF, 25V	ceramic disc
C21,22	0.047	µF, 25V	ceramic disc
C23	0.0047	µF, 25V	ceramic disc
C17,27	1	µF, 25V	electrolytic
C36	1	µF, 25V	tantalum
C7,8	4.7	µF, 25V	electrolytic
C4,13,14,19,20,24,26, 28,35	10	µF, 25V	electrolytic
C30	47	µF, 25V	electrolytic
C9,12	100	µF, 25V	electrolytic
C11	1000	µF, 25V	electrolytic
C31	2200	µF 35V	electrolytic
Semiconductors			
BR1	50V, 1.5A		bridge rectifier
LED1,2	T1 style		red
D1,2	1N5231B, 5.1V DC		¼W zener diode
D3,4,5,6	1N4148		switching diode
Q1,2,3,4,5	2N3904		NPN, transistor
IC1,2	LM324		quad op amp
IC3	LM380		2.5W audio amp
IC4	LM317		adjustable voltage regulator
Other Components			
T1	18V, 2A		power transformer
S1	DPDT toggle switch		
S2,4	SPST toggle switch		
S3	normally open		push button
J1,2	mini-audio		jack
J3	5-pin DIN		jack
J4	RCA phono		jack
F1	½A fuse		with holder
Electret condenser microphone			
PC board			
AC power cord			
heat sink			
enclosure			
knobs			
5-pin DIN plug, mini-audio plugs (2), coaxial power plug.			

*See Table 1. for R51 & R52 values.

Parts kits are availalble from Micro Mart, 508 Central Ave., Westfield NJ 07090. Tel. (201) 654-6008. PC board and components are $29.95, plus $2.50 S&H; the parts kit, less enclosure, heat sink, and knobs, is $49.75, plus $3.75 S&H; the PC board only is $12.95, plus $2.50 S&H; and the power transformer is $4.75 plus $3.50 S&H.

and indistinguishable from hand-sent code.

Other Features

FUNCTION switch S2 disables comparator U2C so you can operate in manual mode. In this mode, you must use PTT switch S3 to key the transceiver. This feature is useful in voice mode when the room noise level causes false XCVR keying, or in the MCW mode to use the VOX Plus' sidetone as a code practice oscillator. A programmable regulated power supply is available for powering transceivers that operate from six to ten 500 mAh NiCd batteries. The output voltage is programmable by changing the value of resistors R51 and R52. See Table 1 for programming resistor values.

Design Details

A few words need to be said regarding some of the "basic" op amp circuits, since their physical implementation is slightly different from the theoretical description. The design of the RC phase-shift oscillator requires some practical modification to attain dependable operation.

In theory, the circuit will oscillate when the gain is set to a value of 1/29. This is a very critical value. If the value is slightly less, the circuit will not oscillate. If the value is slightly more, the output waveform will clip, resulting in distortion. This problem is overcome by adding amplitude compensation to the circuit.

Back-to-back zener diodes are placed in parallel with feedback resistor R4. The zener diodes decrease the gain of the oscillator as the output amplitude approaches the positive power supply rail to prevent it from clipping and distorting the waveform. Because of the zener diodes, you need more gain to get the oscillator started, thus the gain is higher than 1/29.

In theory, the frequency of oscillation of the RC phase-shift oscillator is given as: $f = 0.065/RC$. The addition of amplitude compensation using the zener diodes causes the actual frequency to be lower. It is difficult to predict the actual frequency of oscillation because zener diodes are nonlinear devices, and therefore, linear analysis can not be used to determine it. The theoretical equation does, however, give a good place to start.

A practical note pertains to the use of the LM324 op amp. For capacitively coupled loads, a resistor should be used from the output to ground to increase the class A bias current and prevent crossover distortion (see the National Semiconductor Corp.'s *Linear DataBook 1* 1988). This is the purpose of resistors R19 and R39. Notable distortion was present without them.

The one-shot circuit consists of transistor switch Q2 and comparator U2D. The trigger pulse is applied to the base of Q2 via R25, which limits the base current to a safe value. Each time a positive trigger pulse is applied to R25, Q2 discharges capacitor C19 to ground. The voltage across C19 is applied to the negative input of comparator U2D; the positive input of U2D is fixed at V/2. When C19 is discharged to ground, the voltage across C19

falls below V/2 and the output of comparator U2D goes high.

The output remains high until the voltage across C19 rises above V/2 volts. The charge time of C19 is controlled by the series combination of resistors R26 and RV3, VOX delay. The circuit is re-triggerable because capacitor C19 can be discharged repeatedly by a trigger pulse, effectively resetting its charge time. MUTE switch Q4 is activated by the output of the one-shot by charging capacitor C30 via diode D6 and resistor R31.

The voltage across C30 supplies base current to Q4 via base resistor R49. Q4 turns on and bypasses to ground the audio present at the junction of the voltage divider that consists of R40 and R41, preventing it from reaching the audio power amp U3.

Capacitor C24 provides DC isolation. When the one-shot times out, diode D6 prevents C30 from discharging immediately. MUTE switch Q4 remains on while C30 discharges through resistors R49 and R50, and keeps the audio path shunted to ground. In this way, the attack and decay of the MUTE switch are controlled, and the introduction of noise by the action of the mute circuit itself is prevented.

Construction

Only common components are used in this project. Most of them can be found in your junk box. If you don't have a junk box, you can get all the parts from *Micro Mart* (see parts list).

Due to the number of components, I chose PC board construction. You could also use point-to-point wiring. Photo B. shows the circuit board mounted in a Radio Shack steel enclosure. Note that voltage regulator U4 is mounted on the copper side of the board, keeping the leads as short as possible to minimize RF pickup and to maintain load regulation. This also simplifies access to the aluminum heat sink mounted to the bottom of the steel enclosure. The steel enclosure does not make a suitable heat sink because of its lower thermal conductivity. The dimensions of the aluminum heat sink are 6" x 2.5" x 0.0625".

Connect the transceiver's power, microphone, and speaker jacks with a 5-pin DIN plug, its receptacle mounted on the rear panel. Bypass capacitors C40, C43, C44, C45 and C48 are mounted at the 5-pin DIN receptacle to prevent RF from disrupting circuit operation. Access to the KEY input and TAPE AUDIO input are made with 3.5mm phone jacks. An RCA audio jack is used for the speaker output. Bypass capacitors C39, C41, and C42 associated with these terminals are also located on their respective jacks.

Setup and Operation

Check the circuit carefully before applying power. If all looks good, set the FUNCTION switch S2 to manual and set the MODE switch S1 to the MCW position. Set BASS and TREBLE to center position, and MIC GAIN control to minimum. Set sidetone level control RV1 to minimum by turning it CCW; then turn it ⅛ turn CW. Set VOX delay RV3 and anti-VOX gain RV4 to center position. Connect a 4- to 8-ohm speaker to the speaker jack and a telegraph key to the KEY input.

Before connecting the VOX Plus to your transceiver, turn on POWER switch S4 and check the programmed power supply voltage to ensure its value is correct, as selected from Table 1. The supply voltage should be within 5% of the selected value. Press the telegraph key and listen for the 800 Hz sidetone from the external speaker. Adjust sidetone level RV1 to the desired level.

Connect the transceiver to the VOX Plus. Be sure to use an external antenna to prevent strong RF fields from causing undesirable operation. Tune in a QSO and try varying the BASS and TREBLE controls. You should be able to make muffled signals or tinny signals more natural sounding, and attain better readability.

To operate break-in MCW, change FUNCTION switch S2 to the VOX position and start sending. The VOX Plus will automatically key the transmitter when you start sending code. The transceiver should remain in the transmit mode until about 1 second after you stop sending. If the transmitter drops out between letters or words, increase VOX delay RV3 by turning it CW.

To operate voice, change MODE switch S1 to the voice position, turn the MIC GAIN control to about ¾, and talk only when you what to transmit. Remember, you are now operating VOX, and you should turn the microphone gain down when you're not in a QSO. ■

Mike Kossor WA2EBY, 13 N. 12th St., Kenilworth NJ 07033

73 Review

by Bill Brown WB8ELK

The Lightning Bolt Dual-Band VHF/UHF Quad

Lightning Bolt Antennas
RD #2, Route 19
Volant PA 16156
Phone: (412) 530-7396
Price Class: $50 (2-element 2m, 4-element 70cm);
$80 (4-element 2m, 8-element 70cm).

Two antennas in one compact package.

Whether heading out for a mountaintop, foxhunting or setting up a portable station at a moment's notice, it's best to lug as little equipment along with you as it takes to do the job. For dual-band operation, the biggest hassle is carrying two antennas, along with the associated masts and mounts. All this adds up to additional weight and increased set-up time.

Mike Duddy of Lightning Bolt Antenna has the answer. He has come up with a dual-band 2m/70cm quad that is both lightweight and easily assembled in the field.

The dual-bander provides you with a 2-element quad on 2 meters and 4 elements on 70cm using just eight Fiberglas™ rods arranged to provide four crossed mounts. A larger version is available with 4 elements on 2m and 8 elements on the 450 MHz band.

Easy to Carry and Assemble

I had a chance to test out the dual-bander during a recent expedition out to Monhegan Island, Maine (see front cover). The only way out to this remote island is to take a 10-mile ferry boat ride. Nuge WB8GLQ and I were hoping to operate packet with the space shuttle SAREX mission (unfortunately scrubbed) from the vantage point of the lighthouse on top of the island. In addition, we planned to make a few ATV contacts on 70cm using 2 meters for our talk frequency.

The dual-band quad comes packaged in a heavy-duty 3-foot-long mailing tube. Everything fits nicely inside, providing an excellent way to transport the quad. After packing our station up into two bags we hopped onto the boat to Monhegan. Once on the island, it was an easy hike up the steep trail to the lighthouse with our lightweight packet and ATV station.

The only tools needed to assemble the quad are a small screwdriver and a crescent wrench to tighten the U-bolt clamp to the support mast. The spreader arms are constructed out of ½" Fiberglas™ rods which have grooves for holding the quad loops. Each rod has a threaded hole to accept the mounting screw. The spreaders are pushed through holes in a 2-foot-long square boom. Each spreader is lettered and matches the letter on the boom. The spreaders can be quickly attached to the boom with the mounting screws. The wire loops are held in place by grooves in the ends of the spreaders. The four large spreader arms support the 2 meter quad loops along the ends, as well as supporting the reflector and the last director of the 70cm loops via grooves cut into the middle of the supports.

I found that the best method was to install the loops as I assembled each set of spreader arms. Once complete, all I needed to do was to mount the antenna to my mast with the U-bolt (included with the antenna). This version has holes drilled in the boom to allow end-mounting to the mast. Total assembly time was about 10 minutes.

Photo A. Evan Cooke (l) and Nuge WB8GLQ (r) use the Lightning Bolt quad to make contact on ATV and 2 meters.

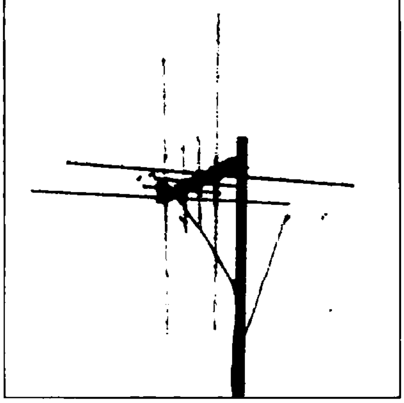


Photo B. Close-up view of the dual-bander quad.

The driven elements both have female BNC connectors attached. I found that the quad loops seemed somewhat loose in their grooves. However, this provided an easy way to change polarization quickly just by sliding the wire in the grooves. For a more permanent installation, you might secure the loops with a dab of epoxy. Lightning Bolt can also provide you with drilled holes instead of grooves for permanent mounting of the loops. Also, I found that the Fiberglas boom seemed a little rough in appearance. It may be a good idea to sand it down some to avoid the "itchy finger" syndrome.

Our total station consisted of a Radio Shack Model 100 laptop computer, a Heath pocket TNC, a Kodak Diconix™ printer, an ICOM 2m HT, a 1-watt P.C. Electronics ATV transmitter, a GBC CCD-100 miniature TV camera, a Radio Shack pocket-sized color LCD TV receiver and, of course, the Lightning Bolt dual-band quad.

Island-Topping with the Lightning Bolt

Although the space shuttle launch was scrubbed, we did make a number of packet contacts up and down the coast of Maine. Also, we made a very successful contact with Jon WA2YVL in Freeport, Maine, on 2m and ATV. The gain is about what you'd expect from a 2-element quad on 2 meters: about 6 to 7 dBd. On the 440 MHz band we saw about 9 dBd gain. This certainly made the difference, since the quad brought Jon's signal from two lights on my HT to a full-scale reception. On 439.25 MHz ATV the 4-element quad made the difference between a 50% snowy picture (using a ¼-wave whip) to a full-color, nearly closed circuit image (using the 4-element quad). We observed about a 3 dB improvement over my home-brew 6 dBd 2-element quad. The front-to-back ratio seemed excellent, and we saw a nice clean pattern as we rotated the antenna.

After a fine afternoon island-topping, we quickly disassembled the quad and headed down the hill for our return boat.

We found the Lightning Bolt dual-band quad to be a great choice for portable operation, and to be sturdy enough to survive a good deal of abuse!

73 Review

by Dick Goodman WA3USG

The PacComm PSK-1

Connect to the world via the Microsats!

PacComm
3652 West Cypress Street
Tampa FL 33607
(813) 874-2980, (800) 223-3511
Price Class: $250 (Includes power supply, manual, and TNC/radio/telemetry.)

Orbiting the Earth at an altitude of approximately 800 kilometers are four satellites which may be accessed and communicated through via packet radio. These birds have something in common that is not shared by the other active ham satellites: They must be accessed using PSK (Phase Shift Keyed) modulation, rather than with conventional AFSK (Audio Frequency Shift Keying), which is the present terrestrial packet standard. These satellites are also known as "Microsats" because of their small size.

•OSCAR 16 (PACSAT): Built by AMSAT NA. Can presently be used as a digipeater. Uplink frequencies are in the 2 meter band, using conventional FM transceivers; downlink is in the 70cm band, using SSB reception. In the near future it will support a store-and-forward mailbox.

•OSCAR 18 (WEBERSAT): Built by Weber State University in Utah. Contains an onboard CCD camera that downlinks its pictures via packet radio. Also contains an ATV experiment which will be activated in the future.

•OSCAR 19 (LUSAT): Built by AMSAT Argentina. Same characteristics as OSCAR 16.

•OSCAR 20 (FUJI-2): Built by AMSAT Japan. Packet store-and-forward mailbox. Uplink 2 meter FM; downlink on 70cm, using SSB reception.

Why Use PSK?

Current packet radio TNCs come with an AFSK modem installed. These are fine for terrestrial packet communication over high quality VHF links, but fail miserably when subjected to poor signal-to-noise ratios or frequency shift due to the Doppler effect. Existing AFSK packet modems must be maintained to within approximately ±50 Hz of the center frequency. Since the Microsats are in low Earth orbit, their velocity in relation to the user is great. This equates to a very large Doppler shift when the satellite is at its closest approach. This shift is so great that a signal tuned in will drift completely out of the receiver bandpass in a matter of minutes. Existing AFSK modems would be virtually impossible to keep tuned during these conditions.

The signals from these OSCARs are also taking fades from spin modulation and are sometimes weak. This is due to the nature of the low gain antennas used on the satellites, and to the orientation of both satellite and ground station antennas (eg: cross polarization).

Finally, the present AFSK standard was actually developed in the 1970s for use in computer telephone modems. It was put to use in TNCs because it was cheap and available, but it's certainly not state-of-the-art! What is needed for satellite work (especially low orbit satellites) is a modem that will perform well in the environment identified above.

The Answer

The PacComm PSK-1 satellite modem fills this requirement nicely. It is a small package, approximately 1½" high, 6" wide and 9" deep. It requires 12 VDC and comes supplied with a small plug-in power supply. The PSK-1 will do the following:

1. Lock on and copy signals that are off frequency by as much as ±400 Hz.
2. Automatically tune the receiver to maintain proper center frequency.
3. Give excellent performance during poor signal-to-noise conditions.
4. Allow you to still use the AFSK modem in your TNC for conventional terrestrial packet operation.
5. Copy the telemetry data from Phase 3 satellites (OSCAR 10 and 13) from their engineering beacons.

Interconnections to Your Equipment

PSK-1 to your VHF FM radio: The cable provided by PacComm has a 5-pin DIN plug for PSK-1 connection on one end; the other end has stripped and tinned leads for attachment to your radio. Note that this is the same pinout configuration for the TAPR PSK Modem.

PSK-1 to your UHF radio: The cable provided by PacComm has a 5-pin DIN plug for PSK-1 connection on one end; the other end has stripped and tinned leads for attachment to your radio. Note that this is NOT the same pinout configuration as the TAPR PSK Modem. This connection **MUST** be made if you want the PSK-1 to automatically compensate for Doppler.

PSK-1 to your TNC's "Radio" connector: The cable provided by PacComm has a 5-pin DIN plug for PSK-1 connection on one end; the other end has stripped and tinned leads for connection to your TNC's "Radio" port. (Note: Your VHF FM radio is no longer connected directly to your TNC, but is routed through the PSK-1 modem. This configuration will allow you to switch to either the TNC's AFSK modem for conventional packet operation, or to the PSK-1 for satellite work.)

PSK-1 to your TNC's modem disconnect header: The cable provided by PacComm has an 8-pin DIN plug for PSK-1 connection on one end; the other end has stripped and tinned leads for attachment to your TNC's modem disconnect header. Also provided is the 20-pin plug to attach to any TAPR TNC-1 or TNC-2 clone inline header. The stripped and tinned leads attach to this and it simply plugs into the TNC's modem disconnect. (Note: The operating manual included with the PSK-1 goes into considerable detail. It took me 15–20 minutes to wire the header plug. If you are presently using a TAPR PSK modem, your existing cable will work fine!)

PSK-1 to your computer's serial port (RS-232 & TTL both supported): Please note that actual packet data is still routed via serial cable going to your TNC. The connection identified here allows control of many PSK-1 parameters from your computer. This is also the port where Phase 3 telemetry data is routed (since it is simply ASCII data and not formatted into AX.25 packets).

Once the PSK-1 is correctly interfaced to your computer, TNC, and Radio(s) the fun begins. When power is applied to the PSK-1 the

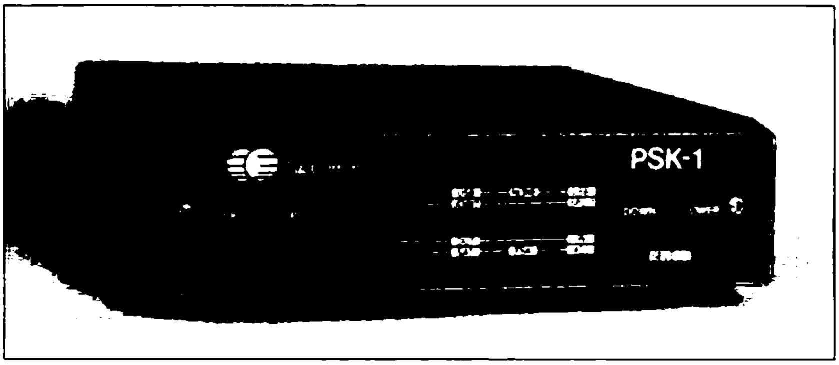


Photo A. The PacComm PSK-1.

front panel LEDS cycle through a short self-test procedure and the modem is ready for use. The front panel of the PSK-1 is logically laid out with 9-status LEDs (which also function as a bar graph tuning indicator), two up/down tuning LEDS, a PLL "LOCK" LED, and two switches which can control set up of the PSK-1.

Operating the PSK-1

The PSK-1 may be set up by two methods. The first is with the FUNCTION and SELECT push buttons on the front panel. The FUNCTION switch cycles through each of the four PSK-1 functions. The SELECT switch allows each of these functions to be configured independently. For example, press the FUNCTION switch until the MODE function status LED is lit (each press of the push button cycles through one of the four functions). Now, by pressing the SELECT switch you can configure the mode function for Manchester PSK for satellite operation, terrestrial PSK, or 400 baud Phase 3 telemetry gathering. Press the FUNCTION switch again and the MODEM function LED will light. By pressing the SELECT switch, the entire PSK-1 unit can be toggled in or out, thus allowing easy access to your TNC's internal AFSK modem. Pressing the FUNCTION switch again will illuminate the JT/SP function LED. Depressing the SELECT switch here selects which radio(s) will be used with the PSK-1. In the JOINT position, all PSK-1 data (both TX & RX) will be routed from the VHF port on the PSK-1. In the SPLIT position, TX data will be routed from the VHF port of the PSK-1 to the VHF radio and RX data from the UHF radio to the UHF port on the PSK-1. Pressing the FUNCTION switch again lights the AFC function LED. The SELECT switch now controls how the PSK-1 tunes the UHF receiver to compensate for Doppler.

The other method of setup is by computer control. The serial port of your computer must be connected to the PSK-1 SERIAL PORT (not the TNC serial port). I recommend using an A-B switch on your computer's serial port to accomplish this (A to your TNC, B to the PSK-1 serial port). The same terminal program that you use for your TNC will work fine for controlling the PSK-1. The default baud rate of the PSK-1 serial port is 1200 baud, no parity, 8 bit word length, 1 stop bit (1200,N,8,1), so initially set your terminal program to those parameters. You can change the PSK-1 serial port baud rate to match your computer to TNC baud rate later. Powering up the PSK-1 will present an entire series of menus which will allow setup of all previously specified parameters, plus options not available from the front panel switches.

Either method of setup is detailed adequately in the PSK-1 user manual. I would strongly suggest reading it from cover to cover before using the modem.

Using the PSK-1 on the Birds

Tune in the signal from one of the four Microsats on your UHF receiver in the SSB mode. Also, ensure that your TNC is in the MONITOR mode and MALL is on. I found the LOCK LED on the PSK-1 to be a bit over-sensitive, and it will flicker on random receiver noise. But, when the satellite is tuned anywhere close to being on frequency, the LOCK LED will illuminate constantly, and the front panel status LEDs will function as a bar graph tuning indicator. If you have the automatic Doppler shift compensation feature active, the PSK-1 will finish tuning itself in and you will not have to touch the receiver while tuning for the duration of the pass! To use the AUTO TUNE feature, you must be using a UHF radio that has mike click up/down tuning capability. If you are tuning the receiver manually, use the CENTER TUNE feature on the bar graph. You should now see data from the Bird scrolling down your screen.

I have used the PSK-1 with a TS-711/811 combination in the automatic Doppler mode and it works quite well. My home station uses a Hamtronics UHF receive converter driving a Kenwood R-2000 HF receiver. I have to tune the receiver manually, but the PSK-1 maintains lock on the signal to about 500 Hz off frequency.

To transmit, dial in the correct uplink frequency on your VHF radio and issue the appropriate connect request with your TNC. Since the satellites have automatic Doppler compensation on the uplink, you don't have to worry about keeping the VHF radio on frequency. Ensure that you don't over-drive the VHF transmitter because PSK is a linear mode. There is an external adjustment for the modem's audio output on the rear panel of the PSK-1.

Some Final Thoughts

The PacComm PSK-1 is an excellent piece of equipment that should appeal to anyone interested in using packet communication through any satellite. Since PSK is more impervious to weak signal and fading conditions than AFSK, it works quite well on the Phase 3 birds, and is superior for terrestrial packet under QRM and QSB conditions.

The PSK-1 will interface to many TNCs. The operating manual details the following interface requirements: TAPR TNC 1 and 2 Clones (TNC 1 will not work on OSCAR 20), PacComm Tiny-2 (what I am using), MFJ-1270, MFJ-1274, MFJ-1278, AEA PK-232 (read the manual carefully), AEA PK-88, AEA PK-87, Kantronics KAM, KPC-4 (KPC-1 & KPC-2 will not work with PSK-1).

I was amazed at how well the PSK-1 copied signals under conditions where an AFSK modem would totally fail. Tuning is not at all critical—get within 400–500 Hz on EITHER SIDE OF CENTER and the data starts scrolling by! Once you've read the operating manual, mode changes and operation are intuitive. The ability to do rapid mode/function changes from the front panel, or more detailed configuration changes via computer control, is a real plus. Finally, the fact that the PSK-1 will decode Phase 3 telemetry blocks adds the capability that would normally require an additional dedicated $100 modem. A program to convert these blocks to intelligent parameters is still required and available from AMSAT.

I hope to see you on the birds!

Pack Your Seabag, "Sparks"

Do you want to be a ship's Radio Officer?

by Michael A. Davidson NØMM

Lisbon, Naples, Palermo, Alexandria, Karachi, Singapore, CUL, IAR, SUH, ASK, 9VG: Ports visited and coastal stations worked by "Sparks," a Merchant Marine radio officer, on a typical voyage. Is this something you always thought you'd like to do? Pack your seabag and come aboard!

Pretend that two days ago you received a call: "She's a freighter going to the Med and Singapore. Do you want the job?" Sure you do!

It's been a busy day. The plane trip, coming aboard, signing on. Now it's quiet. Here you are, on your first "solo" job as a ship's radio officer. You go over the radio room equipment with the vacation-bound radio officer. You've said your goodbyes, and the ship is your home for the next three months. The radio equipment looks familiar. The console with the R/T MF and HF transmitters and receivers, the SSB and linear amp, the SITOR and SATCOM consoles over in the corner, don't look too different from the gear you became familiar with last year, while sailing as assistant radio officer.

The Merchant Marine

What is the Merchant Marine and how do you become a ship's radio officer? When people ask me what I do for a living, and I tell them I sail in the Merchant Marine, they often respond, "Oh, yes, my son [brother, etc.] is in the Marines!"

In the Merchant Marine, you're a civilian. The only direct military connection is with the U.S. Coast Guard Marine Inspection and Safety Division. In addition to their governmental duties, they set training and experience levels, conduct examinations for deck and engineering personnel, and issue Merchant Marine seaman's papers. In time of war, the Merchant Marine would come under naval command and protection. For more information, call the U.S.C.G. at (314) 425-4655.

The vessels of the Merchant Marine fleet are owned by companies whose business is maritime cargo transportation. Some specialized vessels are oil tankers, chemical and liquid gas carriers, bulk carriers, car carriers, and container ships or freighters. Merchant Marine ships carry almost anything that's impractical to transport by air due to weight, bulk, or quantity. The ships range in size from small coastal vessels with only a few crew members, to ULCCs (Ultra Large Crude Carriers) that measure up to 1,500 feet from stem to stern, with crews of 30 or more.

On board there are four departments: deck, engine, radio, and steward. The first officer (chief mate) supervises the deck; the chief engineer, the engine room; and the chief steward, the ship's galley and housekeeping. Each is responsible to the ship's master or captain.

But the radio department is unique. Unlike the other departments, it consists of only one person, the radio officer, who works directly under the captain's orders.

What Does an R.O. Do?

By international law, ships equipped with a radio telegraph station must carry a radio operator to stand watch on the calling and distress frequencies, 500 kHz (W/T) and 2182 kHz (R/T). There are some exemptions for coastal voyages, but generally the SOLAS (Safety of Life at Sea) regulation applies.

At sea, seven days a week "sparks" stands an eight-hour radio watch. The usual hours are from 0800 to 1200, 1500 to 1700, and 1800 to 2000. He monitors 500 kHz and 2182 kHz and logs all traffic sent and received, and silent periods observed. Sparks is also on-call 24 hours a day for emergency repairs to electronic equipment.

In addition to the radio officer's basic duties, he handles the transmission and reception of the ship's traffic. The traffic could be CW (W/T) on medium-wave frequency (450 to 535 kHz) or on the high frequency maritime bands (2 to 22 MHz) using either W/T or voice (R/T), radio telephone, or telex via SITOR on HF (basically the same as AMTOR). Using the satellite communications terminal, SATCOM, traffic is passed telex or voice mode via INMARSAT. Facsimile is being installed in more and more ships. This mode uses a voice channel on the SATCOM for transmit and receive, and it can also be used on HF channels.

Although W/T (Wireless Telegraphy) and R/T (Radio Telephony) are United Kingdom abbreviations, they are used in ITU publications and understood throughout the maritime radio world.

Arrival and departure times can be busy, with messages to the ship's owners, charterers, and agents; observer weather reports; private calls for the crew via the high seas operator on R/T and SATCOM; and reports to the U.S.C.G. Amver system. Amver is a maritime assistance program that provides search and rescue (SAR) efforts. Participation is mandatory for U.S. registered vessels and voluntary for "foreign flag" vessels on voyages over 24 hours long.

Photo A. Radio adventure on the high seas.

Weather reports at sea and FAX weather charts are copied daily by the radio officer. The weather reports are broadcast on CW, SITOR, and voice by the U.S.C.G., U.S.N., and commercial and national coastal stations around the world. And in the winter months, on-station North Atlantic weather ships known as OWSs (Ocean Weather Stations) transmit up-to-date forecasts and storm warnings. They also accept observer weather reports from ships passing through their areas.

Simple accounting for traffic charges is also part of the R.O.'s job. Traffic charges are based upon word count or duration of

the message or telex. Charges, if not known, are requested from the coast station worked, or if via satellite, from INMARSAT tariffs in the radio room. The R.O. is, in effect, an agent for the ship's radio accounting authority or company. It may sound complex and involved, but in practice it's quite simple. After completing your six months under the guidance of an experienced radio officer, you would be very familiar with these procedures.

On arrival in port, you are usually free to go ashore. Maybe even have an "eyeball QSO" with hams you worked off watch at sea. A visit with three JA's in Yokohama, one a Shinto priest, was the result of a QSO on a trip to the Far East. So if you don't have any repairs or inspections coming up in port, you can head down the gangway. But don't forget to check the Sailing Board; you must be aboard one hour before sailing time.

Becoming a Radio Officer

To be employed as a radio officer in the U.S. Merchant Marine, you must be a U.S. citizen and have the following licenses, endorsements, and documents:

1. An FCC **radiotelegraph license.** It must be at least a Second Class Radiotelegraph license with a Six Month Service Endorsement.

2. A **U.S. Merchant Marine Officer's** license, issued by the United States Coast Guard.

3. A **U.S. Merchant Mariner's Document (Z-Card)**, issued by the United States Coast Guard.

In order to sail as the *sole* radio officer on a U.S. Merchant Marine ship, your radiotelegraph license must have a Six Month Service Endorsement. According to FCC Rules and Regulations, Part 83, in order to get the endorsement you must have "...at least six months satisfactory service as a qualified radiotelegraph operator in a station on board a ship or ships of the United States." Catch 22? Not really. If you have military or naval sea time experience with CW, as a radioman or radio operator, you could possibly get some credit for the service endorsement. Check with the FCC. Failing this, all is not lost. Later, I'll describe various methods to get that "sea time" and the endorsement. First, the license.

The Radiotelegraph License

As a prospective radio officer, your first step is to pass the FCC examination for the Second Class Radiotelegraph license (T-2). This two-part examination is held at FCC offices. The code test consists of transmitting and receiving plain language at 20 wpm and 16 code groups per minute. The written, multiple choice test consists of Elements 1, 2, 5, and 6. It's similar to the General Radiotelephone license examination, but emphasizes radiotelegraph practices and procedures, maritime equipment, and radio direction finding. The FCC examiner may require you to draw block diagrams or schematics. On my exam, I had to draw a block diagram and schematic of a direction finder. I'll never forget that the antenna has a "gap"!

An excellent license preparation manual, the *Marine Radiotelegraph Operator License Handbook*, by Edward M. Noll, is available from WPT Publications, 979 Young St., Suite A, Woodburn OR 97071. Tel. (503) 981-5159. If you would rather not tackle the theory and code in one sitting, you can take the examination for the Third Class Radiotelegraph Permit (T-3) and get the code requirement out of the way first. This examination consists of the code test already mentioned, plus Elements 1, 2, and 5, which cover basic law and operating practices.

Then you can then concentrate your studies on Element 6, electronic theory. And while you're in the study mode, don't forget the Ship Radar Encorsement, Element 8. This endorsement will allow you to service and maintain the shipboard radar system. You can take Element 8 separately or with Element 6.

Shipping Out

All that effort and study pays off. Let's say you have your Second Class Radiotelegraph license with the Ship Radar Endorsement. You can almost smell the sea air. But what about that Six Month Service Endorsement? If you have a letter from either a shipping company or a maritime union stating that you have been offered shipboard employment as an assistant radio officer or apprentice radio officer, the Coast Guard will issue you the U.S. Merchant Mariner's Document, or Z-Card, and the Merchant Marine Officer's License.

As suggested above, you can get the sea time for the endorsement through an independent shipping company. You would sign on as an ordinary seaman, engine room wiper, or galleyman. In your off-watch hours, you would stand watch in the radio room. You would have to keep a log for the FCC to evaluate, of the dates and hours you stood the radio watches, and have it signed by the radio officer and master, or captain. This can be a lengthy process, but it's a method that has been successfully used to obtain the endorsement.

Sailing on "foreign flag" ships as a radio operator is another way to obtain experience. This sea time would not be applicable toward the service requirement, but it could put you in a favorable position when applying to an independent company or to a union for an assistant radio operator position. Sailing foreign flag, you would not be required to have the U.S.C.G. license or the Z-Card. You'd only need the FCC Second Class Radiotelegraph license and the appropriate country's seaman's document.

In the past, ships of Panamanian and Liberian registry have been traditionally used by "unendorsed" radio officers seeking experience. But with the increase in countries that offer "flags of convenience" to ship owners (companies that don't have an agreement with a maritime AFL/CIO radio operator's union), the possibilities have also increased. Without any prior ship radio operating experience, it can be tough. But serious listening on the maritime CW frequencies, and close study of the radiotelegraph procedures in the text, can give you the knowledge and confidence to tackle a first assignment. See the table for frequencies.

Maritime CW (W/T) Working Frequencies (kHz)

4188.5	to	4219.5
6285.0	to	6324.3
8377.0	to	8435.5
12565.5	to	12651.0
16754.0	to	16858.5
22250.5	to	22261.5

Sample Ships SITOR (F1B) Working Frequencies (kHz) Dial Setting

4170.8	4174.8
6257.4	6365.8
8344.3	8356.8
12489.8	12516.3
16658.8	16688.3
22197.8	22220.3

Training Programs

Certainly, the least complicated way to go would be through acceptance into a union training program. The two major maritime radio officer unions are: The American Radio Association, M.M.&P, 26 Journal Square, Suite 1501, Jersey City NJ 07306-4168, (201) 795-5536; and The Radio Officers Union, 1415 Moylan Road, Panama City Beach FL 32407, (904) 234-8448.

These maritime unions have agreements with shipping companies to provide licensed radio officers for their vessels. Depending upon their membership needs, the unions have programs for persons with the Second Class Radiotelegraph license, but without the Six Month Service Endorsement. Upon acceptance into the program, you would sail as assistant or apprentice radio officer, gaining service time (endorsement time) under an experienced radio or radio-electronic officer. Both the A.R.A. and the R.O.U. have resident schools, where their qualified R.O.s can take the necessary courses to obtain certification as a radio-electronic officer, with the opportunity for taking advanced courses after certification.

Signing maritime mobile has led to many QSOs where I've been asked about the seafaring life, and how one becomes a ship's sparks. Getting that information on your own can be frustrating. This article should give you a good idea about what those "sparkies" out on the high seas are doing, and about those faraway places. Ready to pack your seabag? ■

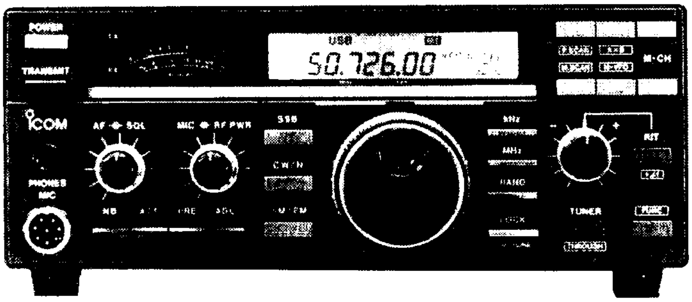
You can contact Michael A. Davidson N0MM at 1118 13th St. (A-54), Boulder CO 80302. Don't expect a quick answer, though; he could be anywhere in the world right now! The last we heard, he was in Saudi Arabia.

73 Review *by David Cassidy N1GPH*

The ICOM IC-726

The HF+6 road warrior.

ICOM America, Inc.
2380 116th Avenue N.E.
Bellevue WA 98004
(206) 454-7619
Price Class: $1,300.



At the beginning of last summer, television reception in the non-cable towns and villages of central New Hampshire turned strange. Every night, stations usually received with extreme clarity were fuzzy and filled with interference for most of the evening. For the rest of the world, this was another of the minor inconveniences of living with old-fashioned broadcast TV. For a ham, it could mean only one thing: 6 meter DX!

Signals were coming from places like Texas and Florida (I even saw the ID screen from a Dallas station). With this evidence of great 6 meter propagation staring me in the face (literally!), it was time to take a look at some of the available 6 meter equipment.

On The Road

Not too long ago, getting onto 6 meters meant buying or building separate equipment for that band. But not anymore. Now you can get the 6 meter band included with your HF rig. ICOM took their IC-725, added 6 meter capabilities, and re-christened it the IC-726. I've had the chance to put in several hours behind the mike of this rig, and this is what I found.

The layout of the operating controls on the IC-726 is pretty straightforward. The mode selection buttons are stacked to the left of the main tuning knob, and the frequency controls are stacked to the right.

The first thing I did after unpacking the rig was throw it on the front seat of my car, attach the antenna and power, and tune in the 20 meter band. Then I started driving the 40-minute commute home from work. After scanning the phone portion of the band with the tuning controls on the supplied microphone (a very handy feature for mobile operation), I called "CQ." For the next 20 minutes i had a very enjoyable QSO with a gentleman in Florida. By the time I pulled into my driveway, my hands were finding the controls without looking at the rig. Even switching bands was no problem; you just push the button marked BAND, use the mike controls to select the band you want, then push the BAND button again. A quick glance at the frequency display, and that's all there is to it. A push of the LOCK button disables the main tuning knob but leaves the UP/DOWN buttons on the microphone functional, so bumping the main tuning knob while reaching for the volume has no effect.

This was my first experience with mobile HF, and I was hooked. The IC-726 is now my constant copilot during my daily commute.

Back in the Shack

Once I arrived home, it took only a few seconds to set up the IC-726 at the operating desk. There is a plate on the back of the rig that tells what each jack, switch and plug is for, so the confident need not even look at the manual. In fact, this rig is so plainly laid out that anyone familiar with modern transceivers probably won't need to read what is, with few exceptions, a well-written instruction manual. (Once the initial excitement of any new piece of gear wears off, I would suggest spending 30 minutes or so with the manual, and if you are adding a linear amplifier or other gear to the chain, I would strongly urge that you take the time to go through the manual first.)

The spec rundown for the IC-726 is fairly standard for a modern HF rig: general coverage receiver, two VFOs, 26 memory channels (with two channels holding split frequencies), RIT, band and memory scanning, and variable tuning rates. One feature that I found very helpful was the built-in 10 dB preamp. Especially during mobile operation, that extra push in the signal-to-noise ratio can make the difference. The built-in noise blanker was also quite helpful in eliminating ignition noise. The back-lit amber display is something else that I liked very much. All operating functions have an indicator, so you only need to look in one spot to remind yourself exactly where you are and what you're doing (another handy feature for mobile operation).

On-the-Air

I spent several weekends operating the IC-726 on every band, and in every available mode. Audio reports were consistently superb, even on AM where the newer rigs can't really compete with the audio quality of some vintage equipment.

Receiver audio is average, as long as you don't use the tiny speaker built into the cabinet. Almost any extension speaker will sound better. If you plan to go mobile with this rig, an extension speaker is a must. The built-in speaker started buzzing at relatively low audio output in the quiet of the shack. Mobile operation, even with the rig on the passenger seat and the speaker facing directly at me, was next to impossible.

This is really not a criticism of the transceiver. In order to put a larger speaker in the cabinet, the cabinet would have to be larger. Consider the built-in speaker as sort of a backup, and you'll have no problems or complaints.

As stated earlier, band changing is a snap. Tuning is very smooth and precise, even when tuning down to 10 Hz steps. The knob tension is easily controlled by a front panel screw, so those who like a looser or stiffer tuning can be accommodated.

What passes for tuning up in a modern transceiver is quick. Set your power level, check your SWR, and you're on the air. The IC-726 will give you 100 watts (40 watts in AM mode) on 160–10 meters and 40 watts (10 watts in AM mode) on 6 meters into an SWR of 1.3:1 or better. The automatic protection circuits kick in at higher SWR and your total output will be reduced accordingly.

QRP operation is a simple matter of turning down your RF power. Even when the power is turned fully counterclockwise, you'll still get about 10 watts output. This is due to the idling current supplied to the driver and final transistors to obtain bias voltage. If you want to operate serious QRP, a simple attenuator could be put in line.

What I Liked

1. Of course, 6 meter capability has to top this list. It's great to have that extra band. You don't get it for free, though. Only you can decide whether or not its worth around $300 to have the extra band. The way I look at it, you're already spending a lot of money so you might as well shell out a little more.

2. The front panel layout of this rig is excellent. Mobile operations are safe and easy.

3. The variable tuning steps are easily accessible. If you want to go from the FM portion of 10 meters to the Novice/Tech SSB subband, a simple button push lets you tune 1 kHz or even 1 MHz at a time.

3. The 10 dB preamp is great! I never realized I needed one until I had one. Now, I couldn't live without it.

4. The back-lit amber display is well thought out and easy on the eyes. Everything you need to know is contained in about four inches of space, which adds another safety margin in mobile operation.

5. The band stacking registers will remember where you were the last time you were tuned to a certain band. At first I thought, "big deal," but I found this feature very useful. Before tuning to another band, I always leave the VFO on a special frequency (the center of the phone portion, or maybe a net frequency). As I'm scanning the bands, that special frequency is waiting for me when I return.

6. The smooth and precise tuning is a real plus. Many rigs get a bit cranky when you're tuning 10 Hz steps. The IC-726 was easy to tune and never wavered.

What I Didn't Like

1. ICOM's biggest sins are sins of omission. It would be nice if the tone encoder and CW filter were standard instead of options, but to not include the carrying handle. . . shame, shame, shame. For a rig that is marketed as a base/mobile unit, the carrying handle should be standard equipment.

2. The manual falls short in helping you set up digital modes. In today's world of packet TNCs and multimode controllers, the transceiver manufacturers ought to get a bit more specific on how to set up their rigs for these modes.

3. The noise blanker circuit does not operate in the AM or FM modes. This made mobile AM work rather aggravating.

Options

ICOM has an extensive line of options for the IC-726. These range from the standard choice of power supplies, antenna tuners and external speakers, to a programmable tone encoder, mobile mounting bracket, and the missing carrying handle.

"Now you can get the 6 meter band included with your HF rig."

The CR-64 high-stability crystal unit will improve frequency stability, especially if you will be operating in extreme weather (the CR-64 is rated from −22°F to +140°F). There are two different CW filters available. The FL-100 is a 500Hz/−6 dB filter, and the FL-101 is good for 250Hz/−6 dB.

Other options include the CT-16 Satellite Interface Unit, which provides easy tuning for satellite communications, and the CT-17 Level Converter for remote control of the transceiver through your computer's RS-232 port.

Final Comments

ICOM's usual quality is evident in the IC-726. After two months of heavy use, including the daily switch from the shack to the car, the rig hasn't given any trouble. The simplicity of operation makes it a breeze to use, especially when going mobile.

If 6 meters is not your cup of tea, then you might want to save yourself a few hundred bucks and check out the IC-725. But if you're the type of ham who is always interested in putting your callsign out on another band or in another mode, the IC-726 is a great way to get on 6 meters with no hassles. The next summer DX season is right around the corner!

When he's not mobile or busy in the ham shack, David Cassidy N1GPH is Associate Publisher of 73 Amateur Radio Today. *You may reach him at 73, Forest Road, Hancock NH 03449.*

73 Review *by Paul Grupp KA1LR*

PT-340 Tuner-Tuner from Palomar Engineers

Palomar Engineers
1924-F West Mission Road
Escondido CA 92029
Tel. (619) 747-3343
Price Class: $100

Adjust your antenna tuner without transmitting.

The scenario repeats itself hundreds of times every day: Two hams are in the middle of a QSO. Conditions are less than ideal, and both operators are hunched over their rigs, straining to hear the other's name, QTH, and signal report.

Suddenly, an S9+40 carrier comes up on frequency, obliterating any hope of completing the QSO. Sound familiar? If you spend any time on the HF bands, you probably have lots of stories to tell about QSOs you've lost due to "carrier pollution."

Tuning Your Tuner

Some of the carriers whining away on the HF bands come and go with such precision that they are obviously the work of some fruitcake intent on disrupting communications. Fortunately, the number of carriers transmitted as intentional jamming is small compared to those used to tune up rigs, amplifiers, or tuners.

You'd have to be living under a rock not to know that you're supposed to use a dummy load to tune your rig or amplifier. However, a surprisingly large number of hams are unaware that there is also a method of accurately tuning an antenna tuner without transmitting a carrier, which brings us to the subject of this review: The Palomar Engineers PT-340 Tuner-Tuner.

The Tuner-Tuner allows you to adjust an antenna tuner without transmitting. On the front panel of this simple device is a rotary switch with two positions, OFF and TUNE. A red LED flashes rapidly whenever the switch is in the TUNE position. On the rear panel are two SO-239 connecters, one marked TRANSCEIVER and one marked TUNER. A 9 volt battery clip and battery holder are also provided.

Just Hook It Up

Installation and operation couldn't be easier. Simply connect the Tuner-Tuner between your transceiver and antenna tuner, and set the front panel switch to TUNE. (You'll hear a loud hissing noise from the transceiver.) Tune the receiver to a frequency near where you wish to transmit, and turn its AGC off. Then adjust the tuner's controls until the noise level is as low as possible. Bingo! You've adjusted your antenna tuner for minimum SWR.

The Tuner-Tuner must be switched off before transmitting. The front panel LED flashes at a rapid rate whenever the Tuner-Tuner is on to help you remember this. If you forget to switch it off before transmitting (and believe me, you will at least once!) an AGX 1/100 amp fuse protects the unit against damage. One spare fuse is provided, and a good thing, too. Just try finding an AGX 1/100 amp fuse at your local hardware store.

Tuner-Tuner In Use

I installed the Tuner-Tuner in my shack just after moving to a new QTH. This provided perfect conditions for a test, since the tower was still in pieces on the ground, and the only antenna installed was a 100-foot wire about 35 feet high, center-fed with ladder line. The antenna was matched with an Ameritron ATR-15 antenna tuner, and fed with a Kenwood TS-940S transceiver. Since the antenna and location were not familiar to me, I had no idea what the correct settings for my tuner controls would be.

Ease of use varied from band to band. The first band I tried was 10 meters. Adjustment of the tuner's controls produced an obvious dip in the noise level from the TS-940S. On 15 meters the dip wasn't as obvious, and it turned out that the dip was an extremely narrow range that was very easy to miss when adjusting the controls. Once I found it, it was just as deep as the dip on 10 meters, but I had to adjust the controls carefully to avoid missing the dip altogether.

On 75 meters, the effect was exactly the opposite. The dip was wide and gradual, and large movements of the tuner's controls produced a barely noticeable reduction in the noise level. Switching the receiver to AM and following the S-meter helped. Dips in the noise level that were barely perceptible to the ear were immediately obvious on the S-meter.

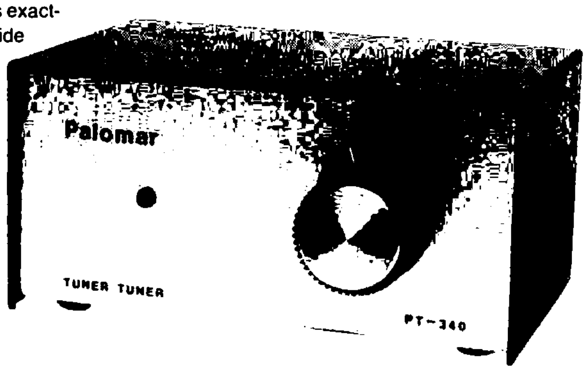
In every case, the antenna tuner control settings I came up with using the Tuner-Tuner corresponded to a low SWR reading on the TS-940S built-in SWR meter. Most readings were around 1.2 to 1, which is a perfectly acceptable match.

My only complaint is that when the fuse is blown (by accidentally transmitting when the unit is on) the Tuner-Tuner still appears to work. The noise level is lower than usual, but the nulls still appear, although with incorrect settings of the tuner controls, resulting in high SWR. This could easily cause problems for a casual user who is unaware of the internal fuse. I'd like to see a mod that causes the Tuner-Tuner to go completely dead when the fuse is blown, removing any ambiguity about its condition.

Conclusions

After using the Tuner-Tuner for a few weeks, I find that it takes a little longer than to simply tune for minimum SWR while transmitting. But that's a small price to pay for eliminating my contribution to the carrier pollution problem. If even half of the amateurs who use antenna tuners used a device like the Tuner-Tuner, the outrageous level of carrier pollution heard on the bands would be significantly reduced. If you use an antenna tuner, you should seriously consider adding a Tuner-Tuner to your shack.

Contact Paul Grupp KA1LR at 22 Lawrence Street, Pepperell MA 01463.



HAMS WITH CLASS

Carole Perry WB2MGP
Media Mentors, Inc.
P.O. Box 131646
Staten Island NY 10313-0006

73 from 72

The melodious sound of "73 from 72" has become familiar on 28.303 MHz every Tuesday and Thursday at 12:30 p.m. EST. Gordon West WB6NOA and I began The CQ All Schools Net two years ago in response to the ARRL's challenge to get more school kids exposed to the airwaves.

I open the Net as the East Coast Net Control from Intermediate School 72 in Staten Island, New York. With over 400 youngsters a term taking my course, "Introduction to Amateur Radio," we felt that the Net provided a great opportunity to involve our students with other schools across the country. Neither Gordon nor I realized that there were so many schools with access to ham radio. We were also delighted to receive letters from many teachers who were listening to us with SWL capabilities. In many cases, listening to the other children on the Net was the motivation for these classes to get involved in ham radio.

Either Gordon or Joe N6CRX is West Coast Net Control, inviting schools across America to check in with us. So many wonderful hams have been supportive by acting as relays during erratic conditions on the 10 meter band. We chose 10 meters so that all Novices would feel welcome to join us.

Benefits of the Net

As any good salesperson can tell you, it's important that your customers (in this case, students) experience a relevance to their lives when you're trying to sell them on an idea. The benefits of getting young people on the air talking to other youngsters are readily observable. Classes speaking with other classes in different parts of the world verifies that it's OK to have fun in school and on the ham radio.

Speaking with their peers gives the children a chance to discuss matters of mutual interest in addition to ham radio. Inevitably, friendships begin to form between the students at different schools. We began some follow-up activities which added incredible enrichment to our radio experiences. We'd like to share some of these ideas with other instructors who are concerned with keeping the interest level high.

One of the immediate benefits of enrichment activities is that every student can pursue his own particular interest at his own speed. Remember that in a regular classroom, ham radio should be used as the vehicle to motivate learning and to stimulate *creativity in all other areas* of the school's curricula.

Extras and Enrichments

A pen-pal exchange is usually the first follow-up to some really good OSOs. Recently, we spoke with Barry KB6RAA, a teacher in Los Angeles, California. The kids in his class had recently experienced a minor earthquake. What a difference it made to be able to speak directly to children who could tell us what the earthquake felt like from a child's perspective. My students were able to ask, "Was it scary? Did you go home or stay in school when the earthquake hit? What precautions do the schools in *your* part of the country take?" It was absolutely fascinating!

The Net has provided some real firsthand current events lessons for us. Many of the children in Barry's class exchanged letters with my classes. It was interesting to compare the newspaper coverage in their local Los Angeles papers with what we were reading on the East Coast. We had some real thought-provoking discussions in class about media coverage of disasters that we had been able to monitor ourselves in class on the radio.

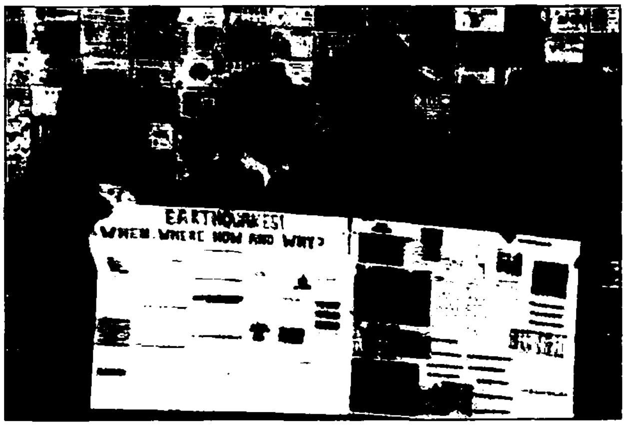


Photo. The children did projects on earthquakes as a result of our contact with Barry's class in Los Angeles.

The next step was to encourage the pen pals to make their own arrangements to speak with each other on the air. Any teacher would be thrilled to see the excitement that these "skeds" generate in the classroom. So many excellent communications skills come out of these follow-up activities that they really qualify as learning at its best.

Another terrific follow-up activity we do with some of the schools we've contacted is to exchange videos. We recently videotaped a tour of our school in Staten Island, showing the different types of classes and what the building and the surrounding community look like. Each child got on the tape and introduced him or herself and told something about their hobbies and likes and dislikes. We sent the tape to the Manchester Elementary School in Fresno, California, where we had made contact with the teacher, Bob Jost AA6AQ. In return we received a copy of the video that his students made for us. It was enlightening for all the youngsters involved with the exchange to see what a school in another part of the country was like.

After several months of wonderful exchanges of letters, pictures, videos, and "skeds," Bob and I decided to share our experience with other instructors. The following is an excerpt from Bob's writings on our coast-to-coast connection.

From Bob Jost AA6AQ

Amateur radio in the classroom has sparked a unique partnership between the students at Intermediate School 72 in Staten Island, New York, and Manchester GATE Elementary School in Fresno, California. These two schools at opposites ends of the country have been meeting on The CQ All Schools Net (28.303 MHz) Tuesdays and Thursdays at 1730 UTC, exchanging video-taped school tours and writing pen-pal letters.

For the sixth grade students at Manchester GATE (a Gifted and Talented Education magnet school in the Fresno Unified School District) and me, it started when we heard through the ham grapevine that WB2MGP and the kids from I.S. 72 were regularly getting on 10 meters to chat with hams all over the world. Several times during the fall quarter, we tried unsuccessfully to check into the Net. Then on January 23, 1990, it happened. We met Carole, and the kids had a great 20-minute OSO. We promptly mailed a QSL card and a list of class members. When a QSL card from New York arrived in Fresno, it created quite a stir. Several days later we met on the air again, and as we concluded our chat, Carole cryptically told the class, "You're going to like what we're sending you!"

Students at Manchester impatiently checked the mail every day to see if the "mystery from Staten Island" had arrived. After several days of disappointments, a thick package arrived at my home. The first item of business the following school day was the viewing of a wonderful videotaped tour of I.S. 72 led by several students. The tape concluded with Carole's class members introducing themselves. A lively discussion of the similarities and differences between the two schools and the kids with the "strange accents" followed.

The students in Room 21 quickly voted to write letters to their new pen pals and to produce a video-taped tour of our school. An exciting day of deciding what to film, planning camera angles, and scriptwriting followed. We decided to start with another CQ All Schools Net contact with WB2MGP. Conditions on 10 meters were dismal, but Jack N5PSJ in Friendwood, Texas, was able to copy both California and New York. As he swung his beam back and forth between the East and West Coast, Jack relayed the message that the videotape from New York had arrived in California, and that as we spoke, we were filming the Fresno video.

Most of February 15, 1990, was spent touring the school and filming the sights at Manchester GATE. The whole school was buzzing about "the kids in New York," and several other classes asked to see the Staten Island video. Students in Room 21 concluded the tape with each class member presenting a short monologue introducing themselves to I.S. 72. After some editing (the original tape was over 90 minutes long), the final copy was mailed along with the first batch of pen pal letters.

I established a marginal contact with WB2MGP on February 20 and several students managed to say hello to their new friends before fading signals ended the QSO. Then on February 27, Carole came right back when we called. The videotape had arrived! Sixth graders crowded around the radio in the back of the classroom to talk to equally excited New Yorkers. The pen-pal letters began arriving once or twice a week. Delighted kids claimed their personally addressed letters or vied for the ones addressed to "any sixth grade boy/girl" or "someone who likes 'The New Kids on the Block'" or "someone into martial arts." Return letters came back regularly. Some students bypassed the school mail and exchanged letters and photographs directly.

As the school year progressed, extended QSOs between WB2MGP and myself found the students talking about a variety of topics ranging from their favorite music groups and sports teams, the weather, school dress codes, after-school activities, homework, and all the other topics intermediate grade students find interesting. The students at Manchester regularly remind me when it's time to listen for WB2MGP. The letters may have slowed down a bit, but the interest in amateur radio and the excitement of talking to someone on the other side of the continent remains. Students in the after-school Ham Radio Club at Manchester GATE School are working on getting their own tickets, like "those kids in New York."

Station details: Bob Jost AA6QA, Room 21, Manchester GATE School, 2305 E. Dakota, Fresno CA 93726. (209) 441-6741. Or 5055 E. Hedges, Fresno CA 93727. (209) 255-9553.

Listen for Us

Many interesting and friendly ham radio operators have checked into the Net to encourage the children to get involved with ham radio. Their spirit and enthusiasm are contagious over the airwaves right into the classroom.

Please join us on The CQ All Schools Net and help us to show young people all that is exciting and stimulating in amateur radio.

Number 17 on your Feedback card

HOMING IN

Radio Direction Finding

Joe Moell PE K0OV
PO Box 2508
Fullerton CA 92633

Throw Your Voice

Surprises are what give competitive transmitter hunting its excitement. When you set out from the start point, you have no idea where you will end up or how long it will take to get there. Usually, you know nothing about what the fox's setup will look like. The hidden T could be a bunch of gear in an old ice chest, or a handie-talkie in the bushes. The antenna could be plainly visible in the clear, or cleverly camouflaged.

The hidden T's modulation seldom gives a good clue. One Sunday afternoon, I had the hunters checking under freeway overpasses instead of in the tranquil park where I was located. All it took was some tape-recorded speedway sounds playing in the background as I talked to the hunters.

Things get even more interesting when the hunters drive up to the hidden operator, but the transmitter and antenna are nowhere in sight. "You mean this isn't the hidden T? We've been listening to you talking." Some of my favorite hiding experiences have been times when I was able to watch all the fun from a nearby observation point, while talking to the hunters through a distant hidden transmitter.

A dual-band mobile transceiver makes this easy. Many models such as the Kenwood TM-621/631/721/731 series are easily modified to serve as a crossband repeater. Set it to transmit on the 2 meter hunt frequency, conceal it with a storage battery and antenna at the hiding spot, and talk through it on the 220 or 440 MHz band from your vantage point.

Dual-band hand-helds can make great remote hidden transmitters, too. On one Sunday afternoon hunt, I put an ICOM IC-32AT and a motorcycle battery down in a sprinkler hole along the Santa Ana River bicycle trail. I talked to the 2 meter hunters through the dual bander via 440 MHz. It was great fun watching the hunters wander around trying to figure out where the transmitter was, but there were some close calls—a couple of hunters almost stepped on the rig!

If you try this trick, be very careful to provide cooling for the radio. I wrapped the IC-32AT in a towel and put it in a plastic bag to protect it from jarring and moisture. In doing so, I gave it too much thermal insulation. I was only transmitting intermittently, but by the end of the hunt, the back of the handheld was hot enough to fry an egg! (Well, almost.) Fortunately, it didn't fail. Next time I'll be sure to allow for free air flow and perhaps include a small fan.

The Fox Commander

Saturday night transmitter hunts in the Los Angeles area require the hider to transmit continuously. Some hiders use endless tape recordings to provide the continuous audio, but most have concocted some sort of tone/ID box. Adding remote control to either system is easy and provides a lot of convenience.

That brings us to this month's construction project. The Fox Commander is a simple, effective remote control system for your hidden T's push-to-talk (PTT) and audio. By adding the circuit Shown in Figure 1, you can "throw your voice," making short or long transmissions through the concealed bunny using your UHF handheld or mobile rig. The Fox Commander also lets you turn the target transmitter and its audio tones on and off with the control transmitter's DTMF buttons.

The heart of this project is a tiny (2½" x 1½") single-channel UHF receiver (Photo A). Originally designed for pocket pagers, it has a sensitive MOSFET input dual conversion circuit, with fractional microvolt sensitivity and excellent adjacent channel rejection. It draws only about 10 mA from a +6 volt power source.

These surplus UHF receivers are available for $12.95 each, plus handling charges, from Lynn Johnson Electronics (LJE). (Lynn WA6LNU has quantity prices for larger orders.) The LJE receiver has no speaker output stage, but this isn't necessary for this project. The audio output is just the right level to drive subaudible tone (CTCSS) and dual-tone (DTMF) decoders.

There is also no squelch on the receiver, but using a CTCSS decoder instead of carrier squelch makes your control link more secure. It also adds immunity to squelch trips from intermod and RFI. The MC3357 IF chip in the receiver has provisions for a carrier squelch, if you are willing to do some micro-surgery to add it, but I recommend the CTCSS method instead.

Crystalling Up

As shipped, the LJE receiver is tuned up on a 454 common-carrier frequency. The first thing to do is to decide on your control frequency and order a crystal (X1). Hams can legally do controlling anywhere in the 420–450 MHz band, except in the 431–433 and 432–435 MHz segments.

Choose a quiet frequency in keeping with the band plan in your area. A call to your UHF frequency coordination council may be in order.

Calculate the crystal frequency by subtracting the IF frequency (21.4 MHz) from the receive frequency, then dividing by nine. For example, a 47.1778 MHz crystal sets the receiver for 446.0 MHz.

Photo A. The matchbox-size LJE receiver mounts under the aluminum cover plate with adhesive foam. Keep the lead to the antenna connector short.

Photo B. The Fox Commander circuit fits easily inside the Un-Music Box. The aluminum cover plate forms a ground plane for the UHF control antenna.

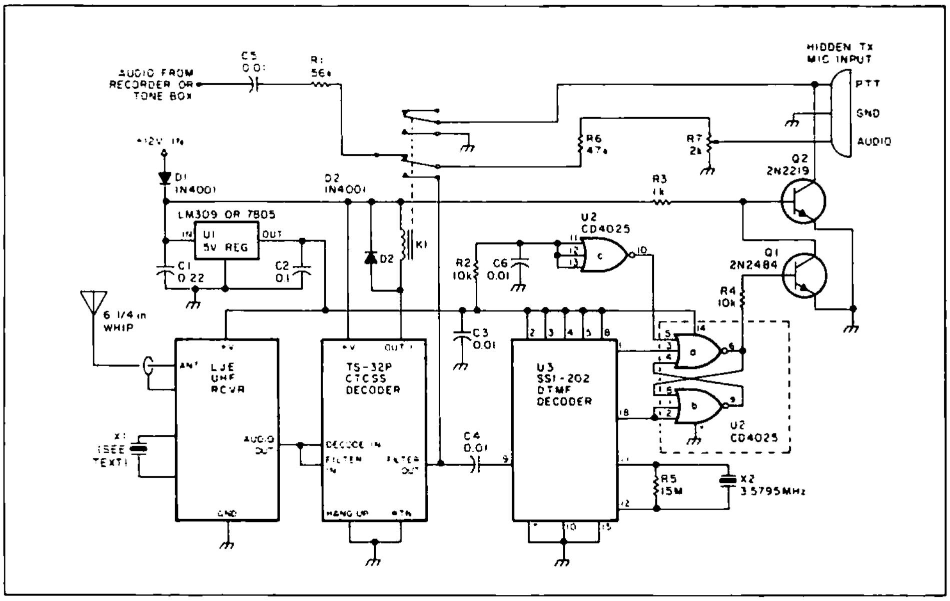


Figure 1. Schematic diagram of the Fox Commander.

Number 22 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

DEC 1

APACHE JUNCTION, AZ The Superstition ARC will sponsor a Hamfest at the P&M Rodeo Grounds from 7 AM–2:30 PM. Admission $1, sales space $3. Talk-in on 147 12/ 72. Contact *Chuck Kruppenbacher KB7ICP, (602) 986–3060*

FARIBAULT, MN The annual Coupage Center Winter Hamfest will be held at the Eagles Club, starting with registration at 9 AM. There will be a Handi-Ham equipment auction, dinner at noon and program. Talk-in on the 146 79 repeater. Contact *Don Franz WØFIT, 1114 Frank Ave., Albert Lea MN 56007*

DEC 2

HAZEL PARK, MI The Hazel Park ARC will sponsor its 25th annual Swap & Shop at the Hazel Park High School from 8 AM–2 PM. Advance admission $2, $3 at the door. Ticket and table reservations by mail. *H P A R C, PO Box 368, Hazel Park MI 48030*

DEC 21

VERONA, NY The Madison-Oneida ARC holds VE Exams the third Friday of every month at the Madison-Oneida BOCES on Spring Rd. Time 7 PM. Technician through Extra class tests cost $4 95. Talk-in on 145 37. Contact *Leonard Popyack WF2V, (315) 853–8974*. Can also be reached on *146.79, 145.37, WF2V @ WA2TVE, or POPYACK@TOPS20 RADC AF.MIL.*

DEC 30

SOUTH BEND, IN The Repeater Valley Hamfest Committee will hold a Hamfest Swap & Shoo at Century Center on U S 33. Tables $5/5' round, $15/8x2 5' rectangular, $20/8' Wall locations. Talk-in on 52-52, 99-39, 69–09, 34–94, 145 29. Contact *Wayne Werts K9IXU, 1889 Riverside Dr., South Bend IN 46616 (219) 233–5307*

SPECIAL EVENT STATIONS

DEC 1-2

FLAMINGO, FL The Everglades ARC will operate W4SVI from 1400Z Sat –1900Z Sun to celebrate the 43rd anniversary of Everglades National Park. Frequencies: Phone–7.230, 14 240, 21.330 and 28 375. CW–7 030, 14 030 and 21 130. Send QSL and two units of postage for unfolded certificate to *EARC, PO Box 113, Homestead FL 33090-0113*

DEC 15-16

NEW JERSEY The Major Armstrong Memorial ARC will operate W2XMN Sat. from 1300–1600UTC and Sun. from 1900–2200 UTC. Fequencies: 10 meters 28.400 ±25 kHz due to ORM. Special certificates will be sent to all stations making contact with us on those days and times. Please send a SASE (8½" x 11") to: *M A M A R C, PO Box 581, Alpine NJ 07620.*

DEC 29-JAN 1

PASADENA, CA The Relay Repeater ARC will operate KE6PE from 1600Z–0400Z, Sat and Sun., from the Wrigley Mansion, to commemorate the 102nd Anniversary of the Tournament of Roses. Frequencies: 14 260, 21 335 and 28 450. Amateurs in California/Nevada can contact the station on 2 meters via the club repeater 144 970/147 410 or on 220 meters via the Condor Connection. For certificate send QSL and 9 x 12 SASE (50 cents) to *Relay Repeater Club, PO Box 81, Arcadia CA 91066-5019.*

EVERY WEDNESDAY NIGHT Trivia Net is held every Wednesday night at 7:30 PM on the 145.17 and 224 56 repeaters located in Rhode Island. Net operators are *Dan KA1BNO* and *Lori KA1OCF*

EVERY THURSDAY NIGHT The RI Technical Talk Round Table group meets every Thursday evening at 7 PM on the 223.88 (KA1PBS repeater). The purpose of the net is to help amateurs with answers to technically related subjects. The coordinator for the net is *Marc KA1EGY*

Continued from page 50

I ordered my crystal from Cal Crystal, a local company. If you order from Cal, just give your receive frequency and state that the crystal is for the Lynn Johnson receiver. Cost is $12.50–$15.00 postpaid, depending on how fast you want it.

If you order from another crystal company, give the receive frequency and crystal frequency, and specify HC-18 holder, 400-size enclosure, and 8.5 pF load capacitance. Better yet, send along with your order the 454 MHz crystal supplied in the receiver. This will help the manufacturer make a crystal that fits and works perfectly on your chosen frequency.

With the crystal for 70cm installed, control range using a 6¼" whip antenna will be several blocks without any further tuning up. If you have access to a weak signal source or a signal generator, peak the RF and multiplier stages for maximum sensitivity. LJE supplies a schematic and parts layout with your order to help you find the tuned circuits.

The TS-32P CTCSS decoder ($57.95 from Communications Specialists) is ideal for this project because it has a built-in audio filter to buffer the received audio and get rid of the subaudible tone ahead of the DTMF decoder circuit. Before installing the TS-32P, use the supplied layout drawing to find jumper JU-1 and cut it.

The SSI-202 DTMF decoder IC is fast, non-falsing, and tolerant of audio input level variations. Better yet, it is cheap and works with an ordinary TV color burst crystal (X2). It's hard to go wrong with this circuit if you use good construction practices. Put sockets on U2 and U3, and check the wiring before plugging in the ICs. Bypass the U3 Vcc supply with C3 right at the socket.

A 7805 or LM309H regulator (U1) supplies +5 volts for all parts of the unit except the TS-32P and PTT control. The LJE receiver works fine at this slightly reduced voltage. Diode D1 protects you from the agony of reversing the 12 volt supply polarity and frying the circuit in your haste to get the fox on the air. (I learned that lesson the hard way.)

Photo B shows a typical tone/ID box with the Fox Commander installed.

Unless you plan to be a long way from the hidden station, a 6¼" whip is adequate for a control antenna. I never bother with an etched board for a simple non-RF project like this, since point-to-point wiring on pert board takes only a few minutes.

Beep—You're On

Operating the Fox Commander is simple. Just key your UHF control transmitter (with CTCSS on) and you are talking through the hidden T.

K1 closes, overriding the tone box audio with the control receiver audio. K1 opens when you unkey the control link. Flip-flop U2 a/b controls the hidden transmitter's PTT. Key the control link and press DTMF 1 to turn on the hidden rig; press 0 to turn it off.

Audio input can come from a portable tape recorder or your favorite tone generator circuit. (See: Moell and Curlee, "The Un-Music Box," pp. 193–200, in *Transmitter Hunting—Radio Direction Finding Simplified*, TAB Books #2701, available from "Uncle Wayne's Bookshelf"; and Morrow, "Hunt the Auto-Fox," in *73 Amateur Radio Today*, August 1985, p. 48.) Automatic CW identification is nice, but not necessary if you remember to identify your hidden transmitter by voice every ten minutes using the control link. Set R7 for proper deviation of the repeated control audio. You may need to change the value of R1 to equalize the levels between your audio source and the control receiver output.

Two transistors (Q1 and Q2) insure enough drive to close the PTT relays in most transceivers. If hunt rules call for regular, timed transmissions, just add a circuit to cycle the PTT off and on by pulling the base of Q2 to ground.

U2c sets the flip-flop to key up the hidden T automatically at power-up. This allows local use of the tone box without the control link, and assures immediate resumption of the fox's transmission if the battery connection is interrupted momentarily. If you would prefer the unit to come up in the OFF mode at power-up, remove the wires from U2-10 to U2-5 and U2-1 to U2-2, then wire U2-5 to U2-3 and U2-10 to U2-1.

Remotely operating your rig will add a new dimension of fun to being the hider, so get started on your Fox Commander. My next column will have more to say about the perils and pleasures of hiding.

Parts Sources

UHF Receiver: Lynn Johnson Electronics, P.O. Box 51268, San Jose CA 95151-1268; (408) 274–2534.

UHF Crystal (X1): Cal Crystal Lab, Inc., 1142 N. Gilbert St., Anaheim CA 92801; (714) 991–1580, (800) 333–9825.

CTCSS Decoder: Communications Specialists, Inc., 426 W. Taft Ave., Orange CA 92665-4296; (714) 998–3021.

Small Parts (Radio Shack Numbers)

SSI-202 DTMF Decoder (U3)	276-1303
Color Burst Crystal (X2)	276-1310
5-volt regulator (U1)	276-1770
Relay (K1)	275-241

Audio Powered Tape Recorder Controller

Add convenience to your hamshack.

by Gregory R. McIntire KE0UV

Have you ever needed a device that would turn a tape recorder on and off through the presence or absence of the audio being recorded? I wanted to record the transmissions from the Russian cosmonauts on 2 meters, but I could never be at home when they were active. I needed just such a device, with a few more requirements. In addition to stopping and starting on its own, I wanted it to operate without external power. I already have too many plugs in the wall. Nor did I want to use batteries, since the device would be in service for long periods of time.

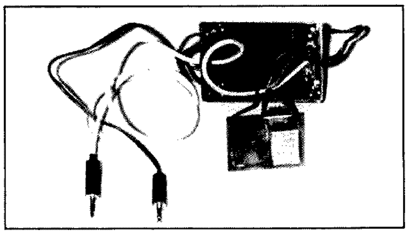


Photo A. The recorder controller circuit, housed in a small plastic box, is ready to be hooked up.

Audio Activated Circuit

After much trial and error experimenting with various types of transistors, I devised a simple yet effective circuit. The finished device is basically a switch that will open or close any circuit (such as a tape recorder motor supply line or pause control), of up to 3 amps or up to 60 volts (it must not exceed 20 watts), by the presence or absence of an audio signal. It requires no batteries or power supply. The audio signal itself supplies the power to operate this switch.

The actual switch is a power MOSFET. Although it requires an extremely low amount of gate current for operation, it does require at least 4 volts at the gate. Voltage at an 8 ohm audio source is much less than 4 volts at normal audio listening levels. In fact, I consider the audio quite loud with a peak voltage of only 1.5 volts across an 8 ohm speaker. So, unless the audio source is a ghetto blaster cranked up to full volume, the voltage level of the audio must be increased in order for it to turn the MOSFET on.

Increasing the Voltage

An 8 to 1000 ohm audio transformer is used for two purposes: First, it presents an 8 ohm load to the audio source (such as the external speaker jack of a radio), and secondly, it multiplies the voltage several times. It still does not step up the audio voltage enough at low or moderate volume levels, though. Therefore, I used a network of four diodes and four capacitors to *quadruple* the voltage output of the transformer. This reduces the available current, but there is still much more current than the MOSFET requires.

Since using an external speaker jack will usually disconnect the receiver's speaker, I included an external speaker jack in this circuit. A second jack supplies the actual audio source for recording. Except for a slight attenuation of the audio, caused by the resistors in series with the jacks, this device has no effect on the quality of the audio source.

Circuit Operation

Audio from an 8 ohm source is fed to the 8 ohm windings of a small audio transformer. The audio is also connected to two other jacks through appropriate resistors, to provide audio sources for external speaker and/or tape recorder input. The output (high impedance) windings of the transformer is fed to a "diode, capacitor voltage quadrupler circuit." This provides enough voltage to switch on the power MOSFET. A zener diode is used at the MOSFET gate to *clamp* the voltage to a safe level, since a *high* audio level from the source can be multiplied above the maximum gate voltage.

The output of the MOSFET (drain to source) does not supply any voltage or current, but rather acts as a single-pole, single-throw switch. This switch opens and closes the circuit of the tape recorder's motor via a relay in the tape recorder or via a remote control jack on the recorder. That is, the

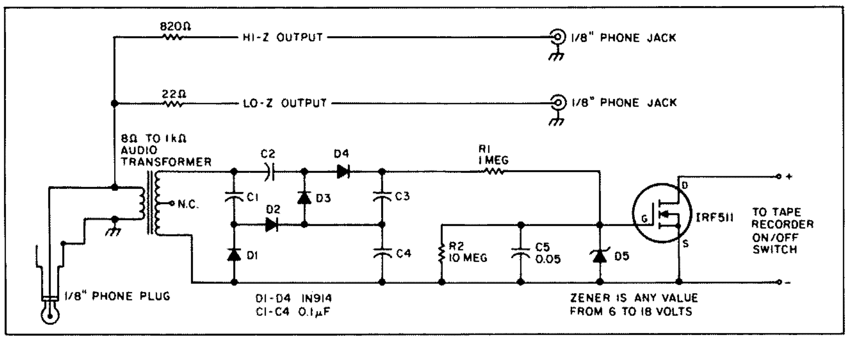


Figure 1. Schematic of the audio-powered tape recorder controller.

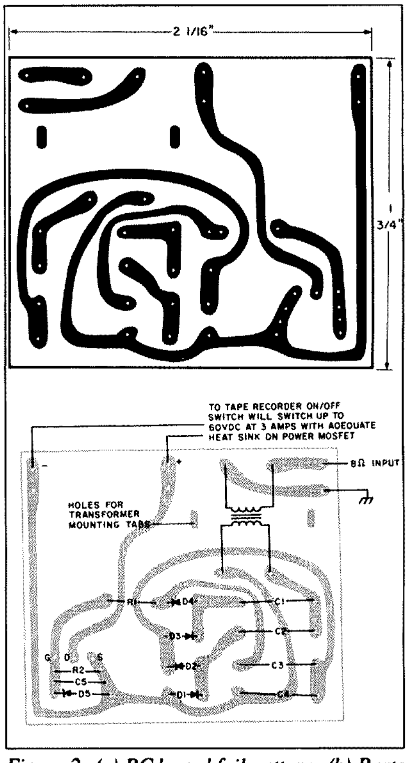


Figure 2. (a) PC board foil pattern. (b) Parts placement.

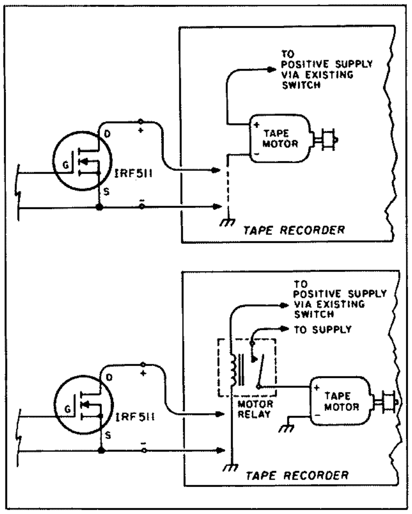


Figure 3. (a) Two methods of connecting the tape recorder controller to the motor of the recorder.

(b) Controlling the recorder via the built-in remote control/pause jack. [Ed Note: Some recorder pause controls have a grounded center pin; just switch polarities on the controller output in this case.]

Parts List

All components are available at Radio Shack stores.

1	IRF511 power MOSFET	RS 276-2072
T1	audio transformer	RS 273-1380
C1,C2,C3,C4	0.1 µF caps	RS 272-135
C5	0.047 µF cap	RS 272-143
D1,D2,D3,D4	1N914 diodes	RS 276-1122
D5	zener diode	RS 276-562*
R1	resistor	1 megohm
R2	resistor	10 megohm
R3	resistor	22 ohm
R4	resistor	820 ohm**
	plugs and jacks as required (see text)	

* Or any zener value between 6 and 15 volts.

** For tape recorder LINE input use an 820 ohm resistor; for MIC input use a 100k resistor or pot.

A blank PC board is available from FAR Circuits, 18N640 Field Court, Dundee IL 60118 for $3 + $1.50 postage.

MOSFET can be inserted into the tape recorder motor supply line if the recorder does not have built-in remote control ON/OFF operation.

Construction Notes

Any construction technique can be employed here, as nothing is critical about this circuit. I made a printed circuit board, as I find this method of construction simpler and more goof-proof than perfboard or point-to-point wiring.

I used a small plastic box (Radio Shack 270-230) to house the unit. I also wired one ⅛" mini phone plug to the input of the device and another such plug to the switched output, as my radio speaker jack and tape recorder ON/OFF jack are both the same. Use whatever type of plugs and/or jacks you need for interfacing your own equipment.

Although it wouldn't cause any damage to put the wrong plug into the wrong jack, I advise labeling the plugs. The IRF511 power MOSFET is internally protected against static shock, but it's still a good idea to take care when installing MOS devices.

Two jacks mounted in the plastic box are connected to the audio source via limiting resistors. They are used for a source of audio for the tape recorder and a source for an external speaker. The 22 ohm resistor is put in series with an external speaker because the transformer already provides an 8 ohm load to the audio source (scanner, transceiver, etc.). This also ensures that an external speaker will not drop the voltage below the threshold of the MOSFET.

Ready to Record

Plug the audio input side of the device into the external speaker jack of any audio source. Plug or connect the high impedance jack into the tape recorder audio input. (If your audio source already has a TAPE jack for recording, this will not be necessary, of course.) If your recorder has a LINE input, R4 should be 820 ohms. If you use the MIC input then R4 should be a 100k resistor or pot. The switched output of the controller should be hooked up to the recorder's PAUSE/REMOTE control jack (Figure 3b). If your recorder has no PAUSE/REMOTE control jack then you can connect the output of the device into the motor circuit of the recorder. If you use the direct connect method, the IRF511 MOSFET must be inserted into the negative or grounded side of the motor or motor relay (Figure 3a). Cut the wire on the motor and connect the drain pin of the MOSFET to the motor or the motor relay. Connect the source pin to ground.

Now turn on the tape recorder and set it to RECORD. Slowly turn up the volume of the audio source until the recorder motor starts turning. This should occur at a low to moderate volume level. If it doesn't, check your wiring and connections. Also be sure you have the polarity correct on all five of the diodes.

I tried several minor variations of this circuit (with different transformers, capacitors, and resistors) and it worked just as well. The main requirement is to send 4 volts minimum to the gate of the MOSFET to switch it on.

The MOSFET switches on fast, but when the audio source stops, it waits a second or two before it switches off. This way it doesn't switch off during pauses between words. At the start of a transmission, you rarely miss a single syllable, and the end doesn't drop off in mid-sentence.

For a couple of months now, I have been using this device, sometimes connected to the 2 meter rig and sometimes to a scanner. It works very well; and perhaps best of all, it doesn't require batteries, wall transformers, or any other source of power! 73

Gregory R. McIntire KE0UV, Hillsview Tr. Ct. Lot 92, Belle Fourche SD 57717.

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

ICOM Computer Control

At this time of year I am always torn between putting together a column devoted to gift giving—"Everything the RTTY/computer ham always wanted but didn't know how to ask for"—or a column devoted to suggestions on what to do while locked in the shack on these cold winter evenings. Well, some material on the latter topic crossed my desk, and it is so good, I just have to share it with you all.

I found this little gem in the amateur radio database on Delphi, and after discussing the matter with the SYSOP, I'm presenting it here. Carl Clawson N7KBV originated this piece on computer control of ICOM amateur radio gear.

N7KBV: Several ICOM products feature a built-in computer interface connected to a ⅛" phone jack on the rear panel. ICOM gives no information about this interface in the instruction manuals that I've seen, but my dealer managed to get it from ICOM for me.

This interface, called the "CI-V," is standard on the following models: 735, 761, 275, 375, 475, and R7000. Earlier models (751, 271, 471, 1271, and R71) used the CI-IV parallel interface, which can be connected to CI-V by ICOM's UX-14 converter.

The information I received was written with the 735 in mind, but a listing of a BASIC program to control the R7000 was appended. I believe it will help with the other models, too. The control codes and data format should be the same for all of them.

The computer interface allows you to do such things as: set and read the frequency and modulation mode; set VFO A, VFO B, or memory mode; select memory channel; store displayed frequency into memory; and transfer displayed memory-mode frequency to a VFO.

Even without a computer, you can run a cable between the remote control jacks of two rigs, and whenever the frequency or modulation mode of either is changed, the other will track it if possible. (If the rigs have incompatible frequency coverages, like the 735 and R7000, funny things can happen.)

The bidirectional interface uses TTL levels on a single line for sending and receiving serial ASCII data. You may need an appropriate hardware interface to convert the RS-232 to TTL, for example. (I understand Commodore computers have TTL inputs and outputs, and require no interface.) I used the Motorola MC1488 and MC1489 chips powered by two 9-volt batteries to interface to my RS-232 line. Table 2 lists the pinouts for this interface. If you'd rather buy something, ICOM sells the model CT-17 level converter for the RS-232.

The interface uses a "carrier-sense, multiple-access with collision detection" local area network protocol so that multiple rigs can be connected in parallel without difficulty. Thus, you can use the same RS-232 line and level-converter interface to control many rigs. Each rig must have a unique address, which is set by internal jumpers. Each model comes factory preset to its own address, which is 04 for the 735 and 08 for the R7000. Table 2 has information on the jumper settings.

In the following list, "receive" and "send" refer to data transmission. Thus a "receiver" isn't necessarily an R7000; it's any device receiving data from the CI-V bus. "Rig" means an ICOM product using the CI-V interface. The rigs send and receive data in variable packet lengths, formatted as follows:

Data Format

Byte #	Contents
1	hex 'FE' (i.e. 11111110 binary, 254 decimal)
2	hex 'FE'
3	<RX>
4	<TX>
5	<Code>
6-n	<BCD data of variable length>
n+1	hex 'FD'

The two hexadecimal FE bytes signal the beginning of a packet, and the FD byte signals the end. <Code> is the control code sent by the computer to the rig, which determines the action that the rig will take. In some cases, the receiving rig will include a control code in its response to the sender; see Table 1. <TX> is the address of the device sending the data, and <RX> is the address to which the data is being sent. When a rig responds to a data packet, it addresses that response to the <TX> in the packet. Thus, if your computer requests a rig to report its frequency, it will address that report to the computer and other rigs will ignore the data. (Of course, the computer can lie about its address and trick one rig into talking to another!) Your computer should use its own unique, non-zero address on the network. I will assume in the examples that the computer is at address 02. There are two control codes that can cause any rig on the network to respond when sent with <RX>=0; I discuss these below.

Bytes #6 through #n contain data required by the control code, in BCD format with 2 decimal digits per byte. Frequency data is sent starting with the byte containing the 1 Hz and 10 Hz digits. These digits are sent even if they are not used by the rig, so that the data format is the same for all rigs regardless of their frequency coverage and resolution. For example, 25.13244 MHz is broken up into two-digit groups: 25, 13, 24, and 40, then coded in BCD. In other words, consider each digit group to be a hexadecimal number instead of decimal. The decimal values of these BCD digit groups are 2 x 16 + 5 = 37, 1 x 16 + 3 = 19, 2 x 16 + 4 = 36, and 4 x 16 + 0 = 64. Now send these groups, starting with the least significant. The complete data packet will be, in hexadecimal: FE FE <RX> <TX> <Code> 40 24 13 25 FD.

If you have more than one rig on the network, you may occasionally receive a sequence of 5 bytes of hex 'FC'. This is the "jammer code" used by a rig to indicate that a collision has occurred. Each rig, when sending, monitors the interface. If it does not receive exactly what it sent, a collision occurred, i.e., another rig was sending data at the same time. If a rig detects a collision, it will send the jammer code as soon as the network is idle. A rig that receives this code realizes that a collision has occurred and ignores the previously received packet. Because the ICOM remote control ports are bidirectional, your computer will receive everything it sends, so you can check for collisions from your computer, too.

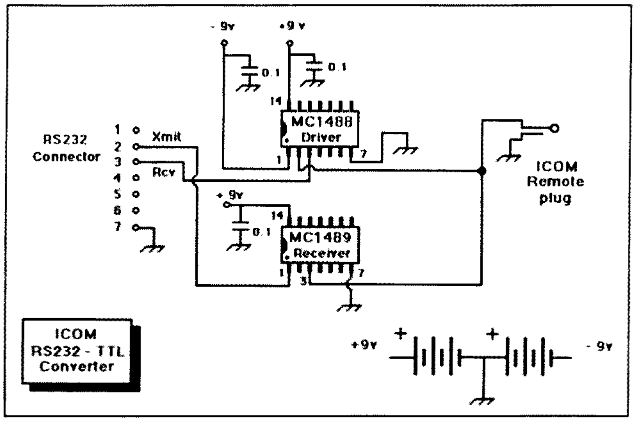


Figure. RS-232 to TTL converter.

Control Codes and Responses

Most of the codes are addressed to a specific rig, which addresses an acknowledgment packet to the <TX> contained in the control packet. The first two codes, 00 and 01, can be sent to the "group call" address, 00, in which case any rig will receive them without sending an acknowledgment. These two codes are sent in this way by any rig when its mode or frequency is changed by manual control, and are received by any rig on the network. This allows a number of rigs to track each other in frequency and mode without computer intervention. Rigs can be inhibited from sending and receiving group call packets by an internal jumper. See the tables for more details. These codes can also be sent with a specific, non-zero <RX>, in which case they will be received by the addressed rig even if the group call function is disabled.

Here are some examples for the 735. The 735 is at address 04 and the computer is at 02. First, let's find out what's in memory channel 1 (code 08 to set the channel, and code 03 to read the frequency). Assume the 735 has the frequency 7.12750 MHz stored in memory #1.

Computer to 735: FE FE 04 02 08 01 FD
735 to computer: FE FE 02 04 FB FD
Computer to 735: FE FE 04 02 03 FD
735 to computer: FE FE 02 04 03 00 75 12 07 FD

Now let's change the frequency and mode to 14.02500 MHz USB (codes 05 and 06).

Computer to 735: FE FE 04 02 05 00 50 02 14 FD
735 to computer: FE FE 02 04 FB FD
Computer to 735: FE FE 04 02 06 01 FD
735 to computer: FE FE 02 04 FB FD

Now store the new result in memory #1. This channel is already displayed, so all you need is code 09, the store command.

Computer to 735: FE FE 04 02 09 FD
735 to computer: FE FE 02 04 FB FD

RS-232 to TTL Converter

This is an easily built converter that will run your ICOM gear from a standard RS-232 line. You can build it in an hour or two for about $10. It uses two inexpensive, widely-available chips—the Motorola MC1488 line driver and the MC1489 line receiver (see the figure). The only other things you need are a box, connectors, a power switch, and a couple of 0.01 or 0.1 capacitors to bypass the power supply leads. I used two 9V batteries for power. Power for the 1488 can be ± 9 to ± 15 volts,

Continued on p. 59

LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Avenue
Saugus CA 91350

Handicapped Waivers: The View of an Expert

April Moell WA6OPS is opposed to the granting of waivers to handicapped individuals who claim that they cannot pass Morse code tests in excess of five words per minute. Moell is an expert in the field of rehabilitation of handicapped persons. Now in private practice, she spent 15 years serving as the Director of Occupational Therapy at St. Jude Hospital and Rehabilitation Center in Fullerton, California, where in 1977 she developed and introduced the Rehab Radio Program.

A licensed amateur since 1976, April Moell holds an Advanced Class ticket. She is an expert in the field of using amateur radio as a therapy tool. In this interview with me, as producer of Newsline Radio, she shares some startling insights into the issue of waivering CW testing for handicapped applicants for amateur radio upgrades.

Newsline: The FCC says that it will waive Morse test requirements for handicapped radio amateurs who claim that they cannot copy Morse code at speeds greater than five words per minute. What effect do you see this having on the handicapped in general?

Moell: I am concerned about it because people who are not disabled sometimes say things like, "Isn't this a nice thing to do for the poor handicapped?" which immediately puts everybody with a disability into one category. It is a put-down because you are saying to anybody with a disability, "You are not as capable as the rest of us."

We have many disabled people in the hobby who have shown us that they are equally capable, and in some cases, more capable. I can think of several hams who are deaf and blind, but who got licenses. I know a gentleman, a quadriplegic, who had to learn the 13 wpm code in his head because he is unable to write.

I think that putting all people with disabilities in one group, and assuming they are not capable, is a very bad precedent.

Newsline: You indicate that the general public does not understand who the handicapped are, and groups them all together. Has this been a problem for the handicapped?

Moell: The non-handicapped make a lot of assumptions about the handicapped. That has been an ongoing problem. The handicapped are individuals with individual differences and capabilities, just like you and me.

Newsline: In teaching amateur radio to handicapped individuals, have you ever run into someone who could not learn the code and who could not get a license?

Moell: Yes, I have, and those have been people who have suffered certain kinds of brain damage so that they cannot process adequately. I think that we have to have certain requirements [for becoming licensed]. If a person can't process adequately, he's probably not going to be able to function adequately on the radio.

I don't see it that differently from driving issues. You do not waive the requirements for a driver's license for someone who may not be safe as a driver. In the case of radio, [while] it might be nice for the severely disabled to hold licenses, if they cannot process information properly, they will not be able to operate correctly or safely with their equipment. But these persons can still enjoy amateur radio as a third party, with a licensed ham running the equipment.

Newsline: Could any of these people who were unable to learn Morse code have passed the theory exam?

Moell: If they haven't been able to handle the code, they often have not been able to handle theory, either, because they couldn't retain the information or became confused. Or they may have trouble learning new material, even though they might be fine with things they learned several years ago.

Sometimes the code has been a real boon for people with physical limitations because it's the only way they can communicate. Some have problems expressing themselves, and it's easier to communicate in Morse code than by voice. I'm concerned that if the FCC grants too many waivers, it'll decrease the pool of amateurs who are using code, and we may make it harder for the disabled people who need to communicate in code. They are not going to have anyone to communicate with.

Newsline: Then you consider the code a valuable tool for the handicapped?

Moell: Again, you can't group all handicapped people together, but I am aware of a number of disabled hams to whom code is the primary mode of communication. I think it's important that learning the code be offered to them [the handicapped]. To assume that because someone is handicapped, she or he can't learn the code is a very faulty assumption.

Newsline: Apparently this waiver system came about as the result of one person who contacted King Hussein JY1, who in turn contacted President Bush, who then contacted the FCC and said, "You will do this." Was it fair to the handicapped of this nation for the leader of another nation to dictate policy toward them?

Moell: This issue is really of serious concern to me—whether it has to do [primarily] with the handicapped or not. To have a citizen go to the leader of another country to gain something for personal benefit, and to have our government react as it apparently has, is appalling. I am as concerned about how this was done as I am about the result.

Newsline: The evidence is that this is what happened. Should the issue now be brought to our legislators or would an appeal to them be a waste of time?

Moell: I would hate to think that in our country that would be a waste of time. Maybe we won't get the decision reversed, but I certainly think that we should let our representatives know that we are not happy with that process. This might be considered small potatoes to some people [an issue important only to hams]. But what other things are going to be done this way?

Newsline: What about our other elected representatives, the American Radio Relay League?

Moell: I think that the League needs to take the lead in saying, "How did this happen, and why wasn't the ham community involved in it? Why weren't we asked about it? Why weren't opinions gathered?" I think the League should be very indignant about the process.

Nobody is saying that we shouldn't make reasonable accommodations for people with disabilities, and I think that reasonable accommodation is being made in the VE system. I have been involved in some of that, where we have had people with disabilities tested. But, we are not talking about that. We are talking about a process that was done in a very inappropriate manner, and I think that is where the League needs to focus.

Newsline: You are considered one of the national experts on using amateur radio in rehabilitation. You say you were never contacted? Do you find it a bit strange that the experts like you and Handi-Hams were left out of the decision process?

Moell: Yes. It bothers me to think that the leader of a foreign government can call and say, "Gee—what about this poor soul?" and have a policy changed [without our government] getting information from nationally recognized groups, especially the Handi-Hams, and the ARRL.

Newsline: How do you think handicapped people who fought for their licenses might react?

Moell: I would certainly hope that people [with disabilities] who currently have amateur licenses will share their thoughts and feelings about this situation. I think it would shed some light on the fact that there are many varieties of disability, and to show [our Congressional representatives] how dangerous and inappropriate it is to try to group everybody together.

There are hams who are essentially bed-bound or house-bound because of cardiac conditions. There are people who are blind, and who have severe cerebral palsy and limited motor control. They operate with mouth sticks and mouth switches and use Morse code! I would like to think that some of those hams will comment about what it took for them to upgrade and how they feel about this new policy.

Newsline: What about the future?

Moell: I am concerned about the precedent that we may be setting. Will someone claim that medication makes it hard to concentrate on learning the rules? Or that a learning disability keeps him from learning and using Ohm's Law? Will there soon be pressure for theory waivers?

Newsline: Playing devil's advocate for a moment, who are we the healthy to decide who should or should not hold an amateur license based on a physical or even a mental handicap?

Moell: I don't think we are deciding that. We're talking about guidelines, and I think we have set some up for people to operate reasonably and safely on the air. People who can meet those requirements with reasonable accommodation—who can show in some way that they understand the rules and regulations of safe operation and can understand the required code—should receive their licenses. It is not discrimination when you set up basic requirements and then let anyone who can achieve them be a part of the Amateur Radio Service.

I do not decide who can drive a car. What we do as a government is to set up guidelines saying that in order to drive, you have to pass these minimum requirements. Many disabled people drive. We make accommodations for them with hand controls, sensitized steering, and things like that. I don't see amateur radio as being different. We are not deciding that somebody with a particular disability should or shouldn't be in ham radio. What we are saying is that we have reasonable standards and we do what we can to help people meet those standards. I don't think it is inappropriate or unrealistic for us to say that not everybody should be able to upgrade.

Newsline: There are some who disagree with your position. A Mr. Moncure in Virginia feels that this waiver system does not go far enough, and it is a handout to the handicapped. He says he may again litigate to get all Morse code requirements eliminated for the handicapped. As someone who has worked with the disabled for so many years, how do you feel about a handicapped person like Mr. Moncure taking that view?

Moell: Maybe the code has been difficult for him, but there are some disabled people for whom theory is as much of a hindrance as code, just as in the rest of the ham population. Some have had problems with theory for maybe some of the same reasons that he cites as causing trouble with the code. It could be medication, but again I am concerned with the blanket approach that says all handicapped are the same. He assumes that everybody [handicapped] has the same problems, instead of focusing on ways he might help his own particular situation.

He sounds like he is bright and energetic enough, that I think he could pass a flexibly administered exam if he applied the same energy level and persistence to studying the code!

Newsline: Winding up, what would you like to see as a result of all that has happened?

Moell: I would like to see the FCC stop for a moment and take another look. Say [to themselves], "Hey, wait a minute, what are we doing? Is this really the right way to go? Let's talk with people who have had experience along these lines."

If, after careful study, the FCC decides that waivers are the way, I hope they will talk with groups like Handi-Hams, because I don't feel that all physicians can sign off for someone and say that that there is a good reason for them not to be able to learn the code. I think you need to have people who are experienced in the areas of physical medicine and rehabilitation making the decisions, and not the general practitioner or opthomologist, for example.

I hope that we will be able to get our leaders at the League and our leaders in Congress to take a look at the process and explain to us why they did what they did. That's what I hope for, and I also hope that nothing like this ever happens again, in this way.

Late News

On Friday July 13, the United States Senate passed, and sent to the president for his signature, the omnibus Americans in Disabilities Act of 1990. The House of Representatives had previously passed an almost identical bill, and President Bush promised to sign it into law as soon as it arrived on his White House office desk. The bill directs the public and private sectors to make sweeping accommodations for the nation's several million disabled citizens, and does this with the force of federal law. Peyton Moncure, the indivdual who has been the moving force behind abolishing all Morse code testing for handicapped applicants for amateur radio licenses, has vowed to use the terms of the act in court to achieve this goal before the end of 1990. It appears that the next act in this drama will be with Mr. Moncure. de WA6ITF

Continued from p. 57

Table 1. Codes and Responses

00 Set frequency. See the text for format of frequency data. See code 05 below for more details.

01 Set modulation mode. One or two data bytes are required to indicate the mode desired.

Data	Mode
00	LSB
01	USB
02	AM
03	CW
04	RTTY
05	FM
05 00	SSB (R7000)

02 Report tuning range. No data required. The rig will report its frequency limits in the format:

FE FE <RX> <TX> 02 <upper limit> 2D <lower limit> FD

(Hex 2D is the ASCII hyphen.) According to ICOM, some rigs report the lower limit first.

03 Report frequency. No data required. The addressed rig returns its displayed frequency to the sender in the format:

FE FE <RX> <TX> 03 <Frequency> FD

04 Report modulation mode. No data required. The addressed rig returns its mode to the sender using the codes listed above. Rigs with selectable bandwidth return an additional byte indicating the bandwidth in the format:

FE FE <RX> <TX> 04 <Mode> <Bandwidth> FD

Bandwidth Codes

Data	Bandwidth
01	Width 1 (widest)
02	Width 2 (narrower)
03	Width 3 (narrowest)

05 Set frequency. The data format is given above. If the data contains fewer digits than the rig uses, the digits sent will be changed and the rest will remain the same. If the rig receives valid frequency data within its tuning range, it responds with a packet containing the data "FB":

FE FE <RX> <TX> FB FD

If it didn't like the data, it responds with "FA":

FE FE <RX> <TX> FA FD

These acknowledgment codes are used by all following commands.

The 735 responds to out-of-range frequency data by sending the "FA" acknowledgement and: 1) If the frequency it receives is less than 0.1 MHz, it sets its frequency to 0.1 MHz. 2) If it received 4 bytes of frequency data more than 30 MHz, it sets itself to 30 MHz. And 3) if it received more than 4 bytes of frequency data, the data is ignored.

06 Set modulation mode. If one byte is sent, it sets the mode per the above table. If two bytes are sent, the second is the IF bandwidth.

07 Set VFO status. If no data is sent, the rig changes from MEMORY mode to VFO mode. If data 00 or 01 is sent, the rig sets VFO A or VFO B respectively.

08 Set memory channel. If no data is sent, the rig changes from VFO mode to MEMORY mode. If BCD channel data is sent, the rig changes to that memory channel.

09 Store displayed frequency and mode into displayed memory channel. No data required.

0A Write frequency and mode from displayed memory channel to a VFO. No data required.

and the 1489 requires +5 to +10 volts. With a suitable DC-DC converter chip, and a 78L05 or 78L08, you could power the circuit off of your 13.8-V supply. Or, if you're clever, you could figure out a way to trickle charge two 9V NiCds off of your RS-232 line. See Table 2 for pinouts and jumper selections.

There are jumpers in the ICOM rigs to set the device address and baud rate, and to enable the group call feature. You must look on the schematic to find them. The jumper to enable the group call feature is called the "transceive" bit by ICOM, and may be labeled with "TRV" on the schematic. The others are labeled "DBn" on the 735 and R7000; look for something similar. The rigs are factory-set to 1200 baud, transceive enabled.

The table gives specific information from ICOM on the 735 jumpers, and for the R7000 I make a likely guess based on the 735 codes and schematic.

Last Words

I certainly thank Carl for his fine work, and I hope that this material will enable many of you to more fully use the features in some of the more sophisticated amateur rigs.

Next month, who knows! Maybe I'll have something from you! You see, I really do read my mail, and I appreciate your comments, suggestions, and tips. Pass them along to me by mail, at the above address, or on Delphi (username MARCWA3AJR) or CompuServe (ppn 75036,2501). Until next time, my best wishes to you and yours this holiday season, for a Happy Hannukah, Merry Christmas, and a happy, healthy new year.

Table 2. Pinouts and Jumper Selections

	Pin	Connect to
For the 1488:		
	1	-V
	2	ICOM remote jack center conductor
	3	RS-232 pin 3 (RD)
	7	Ground
	14	+V
For the 1489:		
	1	RS-232 pin 2 (TD)
	3	ICOM remote jack center conductor
	7	Ground
	14	+V

Ground pin 7 of the RS-232 line and the outer conductor of the ICOM remote jack, and you're on line.

Jumper Selections

For the 735: The jumpers use lines labeled DB0 through DB5 at connector J22 on the PL board. Lines DB0 through DB2 set the device address. Line DB3 is the transceive enable. The baud rate is controlled by DB4 and DB5 according to:

DB4	DB5	Baud
0	0	undefined
1	0	9600
0	1	1200
1	1	300

The 735 is set at the factory to address 04.

For the R7000: The jumpers use lines DB0 through DB7 at connector J17 on the logic board. The address is set by DB0 through DB4; DB5 is the transceive enable, and the baud rate is set by DB6 and DB7. The factory address is 08.

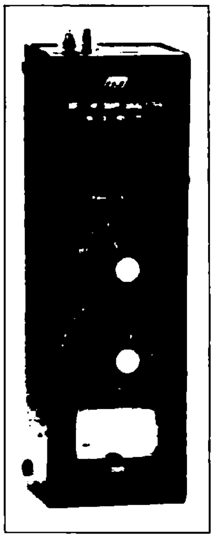
For other rigs: Determine the address by hooking the rig up to your computer and manually changing the frequency or modulation mode. You will receive a group call packet that contains the address of the rig as its 4th byte.

Number 20 on your Feedback card

NEW PRODUCTS

Compiled by Hope Currier

PRODUCT OF THE MONTH



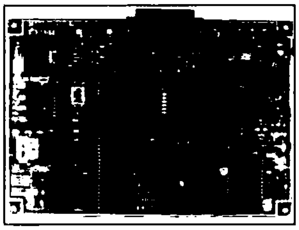
MFJ ENTERPRISES, INC. MFJ-207

The new MFJ-207 HF SWR analyzer instantly gives you a complete picture of your antenna SWR over an entire band, without a transmitter, SWR meter or any other equipment. It makes setting up and trimming your antenna precise and easy. All you do is plug your antenna into the coax connector, set the MFJ-207 to the frequency you want, and read your SWR. It even has a frequency counter output, so you can connect your frequency counter for precise digital read-out. Plus, the MFJ-207 is battery-operated, so you can take it right to your antenna and measure the antenna's SWR directly, eliminating the distorting effects of the coax. Since you can immediately see SWR changes, you'll know right away which adjustments to make.

The MFJ-207 is priced at $100, and comes with MFJ's one-year unconditional guarantee. It runs on a 9 volt battery (not included), or 110 VAC with optional MFJ-1312 ($13). Contact any MFJ dealer or *MFJ Enterprises, Inc., P.O. Box 494, Mississippi State MS 39762; (601) 323-5869, FAX (601) 323-6551, TELEX 53 4590 MFJSTKV, (800) 647-1800.* Or circle Reader Service No 201.

CONTACT EAST

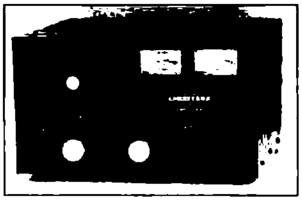
Contact East has released a new supplement to their general catalog. It includes thousands of tools and test instruments for testing, repairing and assembling electronic equipment, including many brand-name items. Product lines, shown in full color with detailed descriptions, have been expanded to include power supplies, oscilloscopes, soldering equipment, DMMs, EPROM programmers, tone test sets, inspection equipment, light meters, sweep/function generators, LCR meters and telecom testers. Also included are work benches, precision hand tools, tool kits, and our custom tool kits designed to meet your individual needs. All products are fully guaranteed. And if you place your order by 4 p.m., it will be shipped that day To order this free catalog, call (508) 682-200 or write to *Contact East, 335 Willow Street, North Andover MA 01845.* Or circle Reader Service No. 205.



COMPUTER AUTOMATION TECHNOLOGY INC.

The CAT-100 automatic control operator will enhance your existing repeater system by adding features usually available only in controllers costing thousands of dollars more. The CAT-100's user-friendly voice and comprehensive manual make it easy to interface with your present controller. It is fully field-programmable, so you can customize the CAT-100 to meet your particular needs. The synthesized voice will announce the time, identify your repeater, and interact with you during control and programming operations. (You can select from seven different voice message announcements tailored to amateur repeater operation.) The scheduler permits automatic control of your repeater system. Sixty DTMF commands of up to 31 digits in length can be stored in the CAT-100 memory. Program the command and time, the CAT-100 will do the rest. Five user function switches, easy to change with a DTMF command, control equipment at the repeater site. A control authorization feature permits you to assign each control operator a unique prefix number, and individually limit their level of control. A computer interface is included.

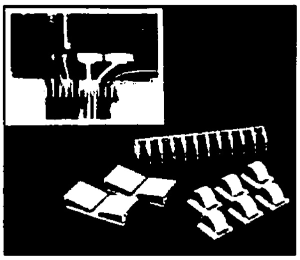
The CAT-100 is priced at $229. Contact *Computer Automation Technology Inc., 4631 N.W. 31st Ave., Suite 142, Ft. Lauderdale FL 33309; (305) 978-6171.* Or circle Reader Service No. 206.



AMERITRON

Ameritron has released a new 600 watt linear amplifier, the AL-811 The AL-811 uses three 811A tubes to deliver 600 watts PEP or 500 watts CW from 160–10 meters. (Easy modification instructions for 10/12 meters operation requires presentation of a valid amateur license.) A Pi-Network tuned input circuit matches the tubes to 50 ohm exciters. It lets even the fussiest solid-state rig perform flawlessly. A vernier reduction drive on the plate control makes tuning precise and easy Dual illuminated meters give you a complete picture of your operating condition: One meter gives you a continuous reading of grid current; a second switchable meter lets you monitor high voltage and plate current.

The suggested retail price for the AL-811 is $600. For more information, contact your Ameritron dealer or *Ameritron, 116 Willow Road, Starkville MS 39759; (601) 323-8211, (800) 647-1800, FAX (601) 323-6551* Or circle Reader Service No. 203.



CURTIS MANUFACTURING

Curtis Manufacturing Co., Inc. has introduced Cable Organizers, an inexpensive new system designed to keep computer and electrical cables neat and organized. Cable Organizers will straighten up those confusing cord tangles behind your equipment. A special custom labeling capability provides quick and easy cable identification. No more unplugging the wrong cord by mistake! Cable Organizers comes with: one 10-slot cord manager, two bundler clips, six runner clips, and ten blank peel-and-stick labels for custom labeling. Self-adhesive mounting allows quick and easy installation.

The suggested retail price is $10, including a lifetime warranty. Contact *Curtis Manufacturing Company, Inc., 30 Fitzgerald Drive, Jaffrey NH 03452; (603) 532-4123.* Or circle Reader Service No. 207.

FINE TUNING

Fine Tuning, a non-profit organization of senior radio hobbyists who specialize in shortwave broadcast DXing, has released the third edition of *Proceedings. Proceedings 1990* is a collection of in-depth reviews, articles and features for the SWBC DXer. Every article is written with expertise by leading radio hobbyists and thoroughly examined by a review panel of top-notch DXers. Included are reviews of receivers and accessories, six great DXing features, compendiums on DXpeditions and modifications for the Sony ICF-2010/2001D receiver, antenna articles, and much more. This year's edition is an essential reference for anyone wishing to increase their enjoyment and skill as a shortwave broadcast DXer.

Proceedings 1990 costs $19.50, plus $2 postage. For more information and prices for postage outside North America, contact *Fine Tuning Special Publications, % John Bryant, RRT #5 Box 14, Stillwater OK 74074.* Or circle Reader Service No. 204.

KUBY KOMMUNICATIONS

Kuby Kommunications' HT and scanner all-metal vehicle window antenna mount assembly is lightweight, compact, and durable. No tools are required—it comes ready-to-use, and it's easy to mount and remove. The mount can be slipped off and tossed into the vehicle for security, but with the window rolled up tight the mount is secure to the vehicle. No scratches on your vehicle's roof! This antenna mount was designed to be used with a supplied HT rubber ducky antenna that eliminates wind loading problems. Optional Beldon RG-58 or RG-174 coax cable is available.

The HT/Scanner BNC is priced at $20 with cable, $13 without, plus $2.50 shipping and handling. For more information, contact *Kuby Kommunications, 19254 Tranbarger Street, Rowland Heights CA 91748; (818) 964-1188.* Or circle Reader Service No. 202.

Number 21 on your Feedback card

ABOVE AND BEYOND

VHF and Above Operation

C.L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake Ave.
San Diego CA 92119

5670 MHz LO & Converter

Browsing through back issues of *Feedpoint*, the North Texas Microwave Society newsletter, I found a design for a 5.6 GHz microwave building block PC board in the July 1988 issue. The original article was published in Germany and is used in this column courtesy of *CQ-DL* magazine, 12/87. Credit for this converter design goes to Roman Wesolowski DJ6EP and Jurgen Dahms DC0DA.

This project was just what the doctor ordered, even in time for Christmas. I could not believe the simplicity of the design and the methods for constructing such a truly fine converter for 5.670 GHz. This discovery completed the search for a working design that I thought was not available. Prior to this I was assembling components to put a system together, and I had not completed the gathering phase. This PC board made the job a lot easier. I have to praise our German amateur counterparts for their workmanship. See Figure 1 for the schematic.

Circuit Description

The circuit uses two GaAsFET amplifiers, one for the receive pre-amplifier stage, and the other for a transmit amplifier stage. The transmit amplifier provides about 5 mW power output and helps balance out the filter loss. The 5.6 GHz filters, interestingly designed, use two ¾-inch copper pipe caps with ¼-inch stubs for coupling into the filters. The depth of the stub determines the bandpass and filter loss. One-fourth of an inch is a good compromise. Each filter is fed from independent transmit and receive mixers, further simplifying the circuitry. See Figure 4 for details.

The mixers use any good mixer device, such as the economical HP 5082-2711 to the high performance stripline HP 5082-2794. Alpha 6-5827-00 stripline types are also suitable. The RFC for the 144 MHz coupling mixer input/output is an air-wound coil. I used 5 turns of #32 wire. If you want a form, use a 1 meg ¼W resistor.

Other parts for the PC board, such as the transmit attenuator, are common. Use carbon resistors, not wire-wound types. The variable inductor L in the preamp stage is a NEOSID 5061. A suitable replacement can be made by winding 4 turns of #26 magnet wire over a ⅛-inch slug tuned form. The stripline PC board is etched from double-sided 0.031-inch Teflon™ stock. Leave the side opposite of the stripline unetched to act as a ground plane. After drilling the board, I used a ¼-inch sharp drill bit to ream out the holes on the ground plane to allow the components' leads to pass through without shorting out. Please note that those connections indicated with a ground symbol on the schematic should be jumpered from the stripline side of the board directly to the ground plane side. Most of the components including the pipe cap filters are mounted on the ground plane side. The chip capacitors, RF chokes, the mixer diodes and a few of the resistors are mounted on the stripline side. See Figure 2 for parts placement and the foil diagram.

Modifications

The IF system for this converter works at 2 meters and has an on-board U-310 receive 2 meter preamp. If you desire, you can replace this preamp with other preamps by coupling directly out of the U-310 input circuit.

I have made several modifications to the original PC board to suit my requirements. For example, I removed the crystal multiplier that was part of the local oscillator drive circuit. The system as originally designed used a crystal oscillator running at 117 MHz, and one tripler and five doublers multiplying the crystal frequency to 5616 MHz. The final doubler circuit, located on the main PC board, is driven by 2808 MHz from the oscillator PC board.

I modified the circuit by eliminating the crystal oscillator PC board and removing the multiplier (doubler) on the main converter PC board. I replaced this entire circuit with a 5.6 GHz, phase-locked "brick" local oscillator (see Figure 3). The brick provides a local oscillator output directly at 5.615 GHz. (5760 operating frequency - 145 MHz IF frequency = 5.615 GHz local oscillator.) This greatly improves stability and simplifies construction. There's nothing wrong with the multiplier string, but if a high quality oscillator is available from surplus, why not use it?

Phase-Locked Brick Oscillators

The phase-locked brick oscillator can be described as a compact, self–

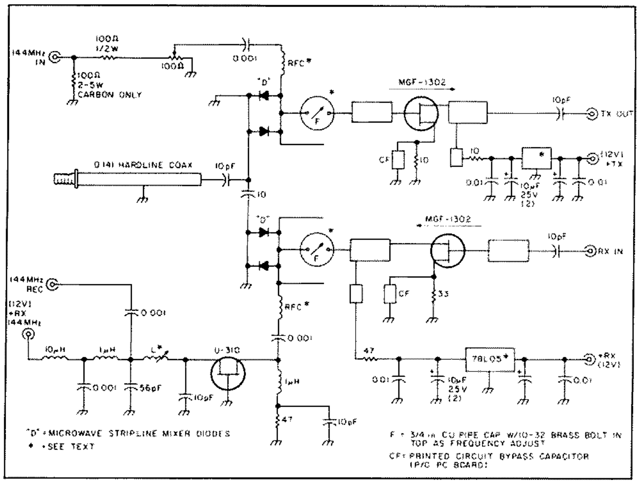


Figure 1. Schematic of the 5.6 GHz microwave converter.

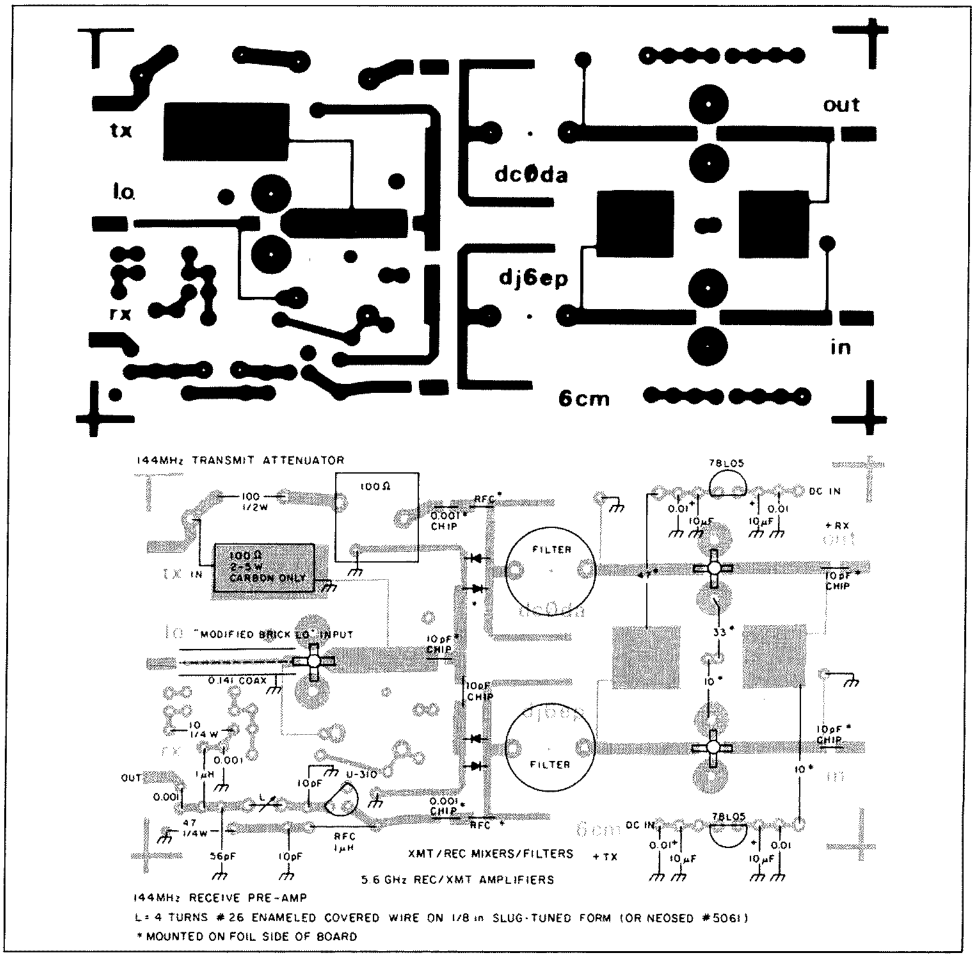


Figure 2. (a) Foil diagram and (b) parts placement (as viewed from stripline side).

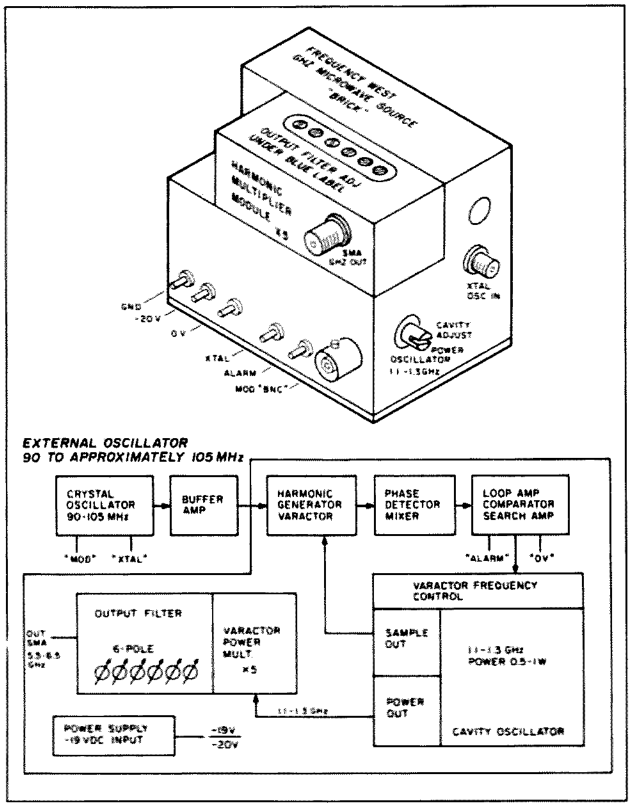


Figure 3. The microwave brick oscillator.

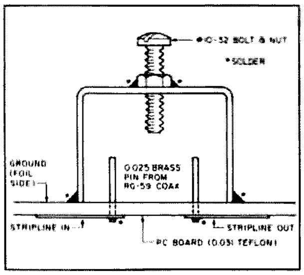


Figure 4. The ¾-inch pipe cap filter for the 5.6 GHz converter. Adjust the pin length for filter shape and loss (approximately ¼ inch long). Use RG-59/U center conductor leaving the foam insulation intact. Adjust the bolt for resonance at 5670 MHz or desired frequency.

contained system for local oscillator injection, hence the name "brick." Availability depends on the drifting winds of surplus. The circuitry internal to a brick is quite extensive; new, they cost about $1700 each.

Working surplus bricks were priced at $25 to $35 when they first started to show up, but prices on all microwave related components have been steadily rising. I have seen tested, certifiable bricks sell for a low of $50 and a high of about $75, depending on their condition. I've picked up bargain bricks al $5 each, only to find them in serious trouble.

The crystal oscillator for controlling the brick can be internal or external to the basic brick. The bricks with internal oscillators make the system simpler, but they are getting hard to find in surplus.

If the brick you obtain needs an external oscillator circuit, see the September and October issues of *73* this year, in which I describe a crystal oscillator circuit and a temperature control circuit in this column.

The brick I am using does not have an internal oscillator, so I've put the external oscillator and temperature circuit to use. It is a lot easier to build the crystal oscillator and buffer stage than the entire multiplier string.

Two transistors for a 100 MHz oscillator and a single op amp for temperature control are not difficult to put together. The external oscillator supplies the brick's harmonic generator, whose overall multiplication ratio is 60. That means that the crystal is multiplied 12 times, and controls the high power oscillator, phase-locking it at the 12th harmonic. A diode multiplier multiplies this phase-locked signal five times to the 6 GHz range. The crystal multiplier (12), times the harmonic multiplier (5), equals 60.

The oscillators showing up on the surplus market are coming from telephone companies, who are shifting from microwave to fiber optics for communications systems. Most equipment is junked out to scrap metal dealers at ten cents a pound. Now this sounds great, but don't forget that the bricks come with about 300 pounds of relay rack and support equipment. After this is removed, the junkyard still has the bulk of iron and unusable equipment left over. You have to find the brick oscillators before they're turned into scrap metal. People are catching on and demanding higher prices for them.

All is not a bed of roses, as you must purchase this equipment without any form of guarantee. My local scrap dealer has told me several times in price negotiations that: "You can't romance a junk man." Their price is firm! Looking for treasure in a scrapyard can be lots of fun, but it takes time and is wrought with dead ends.

Crystal Multipliers

Here are a few hints on how to properly tune a crystal multiplier for comparison. Some of the details are applicable to general building at higher frequencies. Component parts and construction techniques are very important, and not paying attention to detail will give poor results.

First, let's assume a multiple stage circuit like the original one used for the 5.6 GHz converter. Adjust each multiplier stage for a clean stable output, making sure the output is on the intended harmonic. Don't tune the circuit for maximum, as a system, by the tweak and peak method. Sure, it puts out power, but on what frequency? And what about oscillator garbage? I bet it'd have lots of false outputs and be somewhat unstable. It's better to tune each stage as a separate output before proceeding on to the next stage, making sure it's on frequency and not self-oscillating. (Pull the crystal; the system should be stable and not oscillate).

As I stated earlier, circuit construction techniques are very critical because at microwave frequencies, the size of the components becomes a larger and larger fraction of a wavelength. A short wire connection at low frequency can be a very large impedance, or RF choke, at microwave frequencies. Poor construction techniques and solder blobs can render a microwave circuit useless. Don't leave solder rosin on the PC board. Clean it with alcohol or other thinners. Just as you tune one stage at a time, do the same when building. Do not populate the entire PC board with component parts at one time. You could place most of the "nonvolatile" parts, transistors, and diodes only as needed while testing. This should minimize any circuit problems.

Mailbox Comments

Junji Tamara JH1MOY of Tokyo inquires about the brick oscillators for both 10 and 6 GHz bands. We are sending him details on the bricks. He reports that a 2.4 GHz repeater was settled in Tokyo recently, and activity has increased on that band. He believes that soon this wave of interest will cover all of Japan. Well, Junji, I hope the interest spreads and many other amateurs enter the fascinating world of microwave communications. I started in amateur microwave several years ago, being interested in building simple and practical circuits for our microwave bands.

Ray Kajma of Farrell, Pennsylvania, writes that he is looking for an APQ-110 radar manual. He's also looking into small antennas, and has researched a spiral antenna capable of operation over many GHz. A spiral antenna, like a log array, starts small in the center and spirals out, the dual elements getting broader as they circle out. Contact Ron at 317 Florida St., Farrell PA 16121.

Terry N8BIF questions the polaplexer. Does it function as a circulator and detector? Also, he wants me to describe my TWT and power supply. Well, Terry, the polaplexer is not a circulator, in that no magnetics isolate the detector from the transmit source. The polaplexer was first used over 40 years ago with tin cans of resonant size. The polaplexer derives its isolation from the fact that transmit is 180 degrees offset from the receive, one horizontal and one vertical in the waveguide or tube. Local oscillator injection is controlled by upsetting the inherent balance by a 8/32 brass bolt. This bolt is positioned at 45 degrees, and its depth of penetration controls transmit injection of current into the detector diode for bias.

The TWT or traveling wave tube that I use is a surplus item from telephone equipment for analog microwave transmitters that became obsolete. The TWT is a helix tube 6 to 8 inches long, its plate structure a spring-like, spiral-wound coil. It is surrounded by special magnets to contain an electron beam tightly focused in the coil. The power supply requires several high voltages—600, 1200, 3000 volts—which are adjusted to each tube type. Currents are quite low, in the 3 to 25 mA range for 10W types.

My TWT runs off 24 volts DC at 3 amps on transmit and has an output of 10 watts. My Field Day station has two options. One is the lower, more convenient solid state amplifier with 200 mW output for 12 volts at 1.3 amps on transmit. The other is the TWT with its power supply. The power supply is as wide as a relay rack (19 inches). It's 8 inches high and weighs about 10 pounds. The tube is 10 inches long in its protective case.

The large battery supplies that the TWT needs for a full day's operation (two 12V, 26 Ah) pose a problem for Field Day microwave contests. The battery might be overkill, but it can last a full weekend without recharging.

Bricks Available

By the way, I have obtained several extra 6 GHz brick oscillators similar to the ones described in this column. The bricks are as good as new, and I'll make them available for $50 each, postpaid U.S. They require an external oscillator (100 MHz crystal, approximately). All have been tested and are in good condition, phase-locking at 6 GHz, with the typical 6 GHz output 50 to 100 mW (+20 dBm maximum).

The last weekend of the ARRL 10 GHz Contest is about to start, and I hope to get some pictures to let you know what's happening. As always, I will be glad to answer any questions concerning this and other VHF/UHF microwave-related items. Please include an SASE for a prompt reply. 73 Chuck WB6IGP

Number 23 on your Feedback card

ASK KABOOM

The Tech Answer Man

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Still More Troubleshooting

Last month we discussed the ins and outs of various radio circuit stages, with a slant toward understanding and fixing them without schematic diagrams. There's plenty more to go, so let's get right to it.

Detectors: This is rather a broad area. The circuit configuration will depend, of course, on the mode (AM, SSB, FM, etc.) being detected. In a multimode rig, several detectors will be present. The simplest detector is the diode used in basic AM receivers.

You will find it hanging off the end of the last IF transformer. Generally, it either works or it doesn't. However, most rigs, even if they receive AM, avoid the diode detector because there are much better-performing schemes. The product detector is a balanced arrangement whose output is the product of a local oscillator and the received signal. By "product" I mean the mathematical kind, as in multiplication. So, this circuit has some gain, instead of the loss inherent in the passive diode detector. Also, by feeding in the BFO instead of the local oscillator, the product detector makes a very nice SSB and CW demodulator. Consequently, it is common in sideband HF rigs. As with all detectors, look for it at the end of the IF chain.

It may be an IC or it may have diodes, transistors or FETs. The giveaway is that it has two inputs and only one output. It is essentially a mixer, so it looks like one. If it doesn't seem to be working, check that both inputs are there before you start yanking any parts. If you do pull parts to check them, pull and replace them one at a time to avoid unbalancing the circuit by swapping "identical" components.

FM is another story altogether. Various detector schemes have been developed over the years, including the ratio detector, discriminator, pulse integrator, etc. The job of the FM detector is to convert wiggles in the incoming carrier frequency into corresponding voltages. The result of this process is reconstruction of the same audio signals which caused the frequency wiggles at the transmitter. Most rigs use discriminator-type detectors, which consist of two diodes and an IF coil with an extra winding. The coil has to be tuned to the unmodulated carrier frequency for the circuit to produce good audio. If it is even a little bit off, the recovered audio will be significantly distorted. I remember one rig that received clear audio when disassembled, but always sounded distorted when the case was put together. It turned out that someone had replaced the original, magnetically-shielded speaker with a cheap, unshielded one. The new speaker's magnetic field was detuning the discriminator coil when the case was assembled, because it was right on top of it! Moral: **Never take ANYTHING** for granted.

Some rigs use ceramic discriminators. These are small, pretuned, three-legged beasties. Because they have no adjustments, they can be looked at as either/or devices: Either they work, or they don't. They have no active components, so they usually work.

Pulse integrators are not common in radio equipment, but they are excellent, low-distortion FM detectors and are worth exploring, as they are handy for home-brewing. The idea is simple: Make narrow pulses from the incoming carrier by applying it to a monostable multivibrator (one-shot). Now integrate, or low-pass filter, the pulses with a simple resistor/capacitor (R/C) filter, and voilà, audio! As the carrier frequency increases, the "on" time of the pulses will be more frequent, causing the capacitor's voltage to rise. As the frequency decreases, the "on" time will be less frequent, and the cap's voltage will decrease. The fluctuating voltage will correspond to the original audio signal.

Low-level audio amps: If you have a signal at the output of the detector, but have no audio closer to the speaker, check the low-level amp stages. These are straightforward circuits, and they may be made of transistors or ICs. In some rigs they're op amps. In any event, their function is to build the signal up enough to drive the speaker amp stage. The signal voltage should get bigger at each stage or, in the case of an emitter follower stage, it should stay about the same.

You may wonder at the purpose of an amplifier that seems to have no gain. Why is it there? Because there are two kinds of gain. When the signal gets bigger, that's voltage gain. When it doesn't, the purpose is most likely current gain. In other words, the stage's output can drive a lower impedance load without getting wiped out. Current amplifiers are called "buffers," especially when they are made from op amps.

Noise blankers: There are various types, but the basic idea is to blank the audio output at the instant of a noise pulse because the brain finds the absence of sound far less intrusive than a sudden "pop." Blankers use a high-pass filter to look for noise pulses, which have a far faster rise time than normal audio. It can be hard to tell when noise blankers are broken. They can be pretty particular regarding which noises they will eliminate, even when they work. Unless you have some handy source of impulse noise, such as an electric drill, you will have to check components out-of-circuit.

Some noise blankers can be fairly complex, with variable levels, thresholds, time constants, etc. These can involve digital gates and decision-making circuits. Just as with the simpler variety, you need to inject noise to do any real troubleshooting. If you do try, simply trace the noise pulses through the high-pass filter into the noise amp and any circuits that follow.

Squelch circuits: These can fool you into thinking your low-level audio amps are not working because they gate the audio on and off. Some squelches have their own gate transistors, while others short out the base of the first low-level audio amp. If the amp doesn't seem to work, always check the squelch first.

Although some SSB rigs have squelch circuits, they are most common on FM rigs, where they're an absolute necessity because of the loud blank-channel "whoosh" which would otherwise drive you crazy. The usual FM squelch technique is to exploit that whoosh. The annoying noise contains lots of high-frequency audio energy which is outside the normal signal passband that would be delivered by a transmitting station. A high-pass filter, followed by a rectifier and smoothing filter, will deliver a DC voltage when the noise is there, and next to nothing when a carrier is present. (Even if there's plenty of audio modulation on the carrier, it will never approach the high-frequency content of the noise.) The output of the rectifier/filter drives the squelch gate transistor. Some squelch circuits can be a bit more complex, but the basic scheme is the same. If you have no audio, check the squelch gate. It may be shorted. If the audio's there but the squelch won't work, it may be open. Of course, check the input to the transistor first—the trouble may lie farther upstream.

AM/SSB squelches work just the other way around. They look for an absence of signal, clamping the audio off when the signal drops below the threshold you set with the squelch control. With AM and SSB, of course, there is no loud wideband noise because the IF stages are not being driven to their saturation point. In fact, a major objective is that the front end and IFs be as quiet as possible. The troubleshooting procedure is pretty much the same as for FM rigs, except that the signal levels in the early stages are inverted, and there is no high-pass filter. It all still comes down to a gate being driven by the received signal.

Audio power amps: These, of course, drive the speaker. Usually, the audio power amp is a current amplifier and does not exhibit voltage gain. If discrete, it is almost certainly a push-pull circuit, or some variation. In this scheme, there are two transistors and each one amplifies only one half of the audio waveform. Severe audio distortion in the power amp is nearly always caused by one of those transistors failing. If it is accompanied by hum which does not vary with the volume control, suspect a shorted transistor. If not, look for an open. Often, these transistors are matched pairs, and should be replaced the same way. Using off-the-shelf, unrelated parts can cause overheating and increased distortion. Also, when you replace a shorted transistor, be sure to replace any resistors connected to its emitter, as they may be damaged. If the transistors are good, see if there is a large, electrolytic cap between the amp and speaker. A shorted or leaky one will often cause symptoms which mimic a bad transistor.

IC power amps are becoming increasingly common. When they go, they usually get so hot you can't touch them for more than a second. If the audio looks good going in but nothing comes out, and the speaker coupling cap is OK, the IC is probably bad.

By the way, before you get too involved in tracking down power amp troubles, check that the speaker is good and is **CONNECTED**. A bad earphone jack or blown voice coil can waste lots of your time. Blown speakers are especially common in HTs because they are often played at high volume in cars. Also, some HT speakers are rated far below the power level the rigs' amps can deliver.

The Circuits

Now, let's look at some circuits peculiar to transmitters.

Speech processors: There are two types, AF and RF. The audio frequency processors usually are compressors, and work much like the automatic level control circuits on cassette tape recorders, only faster. They attempt to keep the average audio level close to the peak level. Although the RF technique has dominated for many years, AF processors have begun to reappear, and they are remarkably effective. If the processor passes audio but does not compress, check the variable gain element. Typically, it's an FET connected between the input and output of the amplifier stage passing the audio. If there's just no audio at all, check the amp itself.

RF processors are considerably more complex. They actually work at IF frequencies. The basic scheme is to take the modulated IF signal and deliberately overdrive it so that the peaks are clipped off. The result is that the average level is close to the newly-clipped peaks. To avoid the horrendous distortion and splatter this seemingly ugly process generates, the signal is then fed through a bandpass filter which smoothes the edges and keeps the signal within the normal 3 kHz limits. If there's no output, check all stages, starting from the processor's input, for the presence of a modulated carrier. You need to put audio into the mike, and you actually may have to operate your transmitter to do this test, so use a dummy load. Under no circumstances should you be on the air as you talk into the mike and start probing for signals. Needless to say, be careful to avoid injury when working near a live transmitter.

If the processor passes a signal but does not seem to have much effect on it, there probably isn't enough gain to drive it to clipping. Remember, below the clipping point, the whole thing is just an amplifier. You should be able to see the clipping on the signal at the bandpass filter entry point. It not, check the gain stages between the mike and the filter.

Well, once again I'm out of room, and we still aren't finished! Next month, we'll wrap this up and move on to something else.

QRP

Low Power Operation

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The Variable Crystal Oscillator

When you start talking about QRP, without question the conversation turns to portable-mobile setups. Portable requirements are a bit different as opposed to home station use. Note, however, that when I'm talking portable, I'm really talking portable. Small rigs you can carry into places you wouldn't dare take a commercial rig. Wes Harward W7ZOI described such equipment in his mountaineering rigs. Smaller controls, less energy use, and frequency stability are utmost. In keeping with the topic of frequency control, this time we'll look at a special type of frequency control: the VXO.

The Variable Crystal Oscillator, or VXO, is a very good compromise between being rock-bound or using a less-than-perfect VFO. In portable use, a VFO can sometimes be extremely hard to keep stable, due largely to the temperatures you encounter in the outback. Mechanical stress also affects the stability of the VFO. It is difficult to keep capacitor stator-shaft bearings, drives and vernier dials operating correctly while sitting on top of a rock. A VFO will more than likely get bounced off frequency if the rig is dropped a small height, say off the top of our rock ledge onto the ground.

Comparisons to the VFO

A VXO can overcome most of the troubles affecting the VFO—at a cost. We lose a great deal of flexibility. Even the best designed VXO has a limit on the amount of swing one can "rubber" the crystal, depending on the frequency used. The type of crystal and circuit of the VXO will give us the required frequency spread. We can get about 2 to 12 kHz of swing. The lower the operating frequency, the less the amount of frequency swing. For 80 and 40 meters, you can look at about 2 to 4, maybe 5 kHz worth. As you go higher in frequency, you can achieve a much wider frequency swing. At 20 meters, you can have a VXO with a 10 kHz swing. On 15 meters, you can sometimes get a VXO range of 12 kHz—maybe more. Above 15 meters, you don't see too much use of the VXO, just too much ground to cover. You'll still need a shoe box full of crystals to cover all of the 10 meter band.

Because the VXO can give you crystal control stability with the movement of a VFO, now and then we'll see them used in VHF gear. Running the VXO at a lower frequency, we can get excellent stability with multiplier stages in the transmitter to achieve the required operating frequency. Changing the frequency of the VXO will result in a large frequency shift at the final stage. You'll see this scheme often used in homebrew 2 meter transmitters.

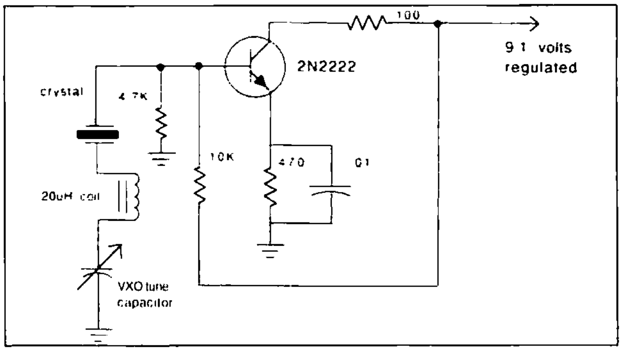

Figure. The classic VXO circuit. The inductor gives the crystal more swing.

Crystal Type

Often, the type of crystal you use will make or break the VXO. The popular FT-243 crystals will not work very well with a VXO. In many cases, the VXO just won't work at all. You'll find the frequency swing to be very little, and in some cases, unstable. The best bet is the AT cut crystals. I get my crystals from Jan Crystals *[see "Updates" in this issue for the correct phone number]*. I use a 30 pF load capacitance in a HC6/U holder. You can use the least expensive crystals; you're not launching missiles with these, so get the 0.01% tolerance rocks and put the change in your pocket.

I've used various VXOs in the past. Some have worked great and others have been vast disappointments. All but a few real poopers have provided stable operation.

The figure shows a classic VXO circuit. Note the coil in series with the crystal. This inductor gives the crystal an even greater swing. But you have to be careful not to increase the inductance too much, or you'll lose control of the crystal and the circuit will then become a VFO. You'll need to experiment. A good rule of thumb is to use about 15 µH for 30 meters, 20 µH for 40 meters, and 12 µH for 20 meters. Again, these are starting values. Nothing is set in stone, so you must experiment for accuracy.

Selecting Crystal Frequency

Deciding on the frequency of the crystal can be frustrating! I've found out the hard way that you just can't be sure where the crystal will oscillate! Another rule of thumb is to choose a crystal *lower* in frequency than what you need. Most VXOs will oscillate the crystal *higher* than the frequency marked on the crystal, so the VXO control will then allow for frequencies *higher* than the marked frequency.

If you order a crystal at 10.102 MHz, the oscillator will output a frequency of 10.102.7 MHz because of the 0.01% tolerance of the crystal. If the crystal is used in a local oscillator, you can add capacitance to *lower* the operating frequency of the crystal. Since we're not using the crystal in this application, we have to adjust the output to suit our needs. When we connect the VXO capacitor, we swing the crystal's frequency even *higher* than marked. With the VXO I have been using for some time, I can get about 7 kHz worth of swing, all on the higher end of the marked frequency.

Now just when you thought it was safe to break out the crystal catalog, you have to consider that some VXOs will move the crystal frequency both lower *and* higher than the marked frequency. This seems to happen when the Pierce crystal oscillator is used as a VXO. In most cases, the VXO will only allow you to move the frequency higher.

Even though the VXO is crystal controlled, be sure to include voltage regulation to the oscillator. You don't want a chirpy signal on the air. You can use a small zener diode. I prefer the 78L08 three-terminal regulator for VFO/VXO use. They're cheap, easy to use, and work great.

As in the construction of VFOs, be sure to enclose the circuit with some type of shielding. Double-sided PC board is great for this.

You may also want to use a vernier drive attached to the main VXO capacitor. This will help in tuning in the needed frequency. Sometimes the VXO capacitor and crystal combination cause a nasty little problem. The tuning becomes nonlinear. The frequency spread is not distributed evenly thoughout the tuning range of the capacitor. This results in having the entire tuning range of the VXO bunched together on one end. Best bet is to replace the crystal and or tuning capacitor.

Don't Overlook It

A VXO can prove a good trade-off between moving all over the place with a less than perfect VFO, to moving a little bit with rock-solid stability! Don't cut the VXO short for your next transmitter project. Look for a VXO 30 meter transmitter coming very soon next year. Next month we'll start on a station transmit control board. Also, we'll convert the Drake "B" and "C" series receivers for the WARC bands.

Until next month, everyone have a good holiday season, and see you next year, here in the "QRP" column.

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B. Paid and/or Requested Circulation 1. Sales through dealers and carriers, street vendors and counter sales	16478	17174
2. Mail Subscription (Paid and/or requested)	27482	27459
C. Total Paid and/or Requested Circulation (Sum of 10B1 and 10B2)	43960	44633
D. Free Distribution by Mail, Carrier or Other Means Samples, Complimentary, and Other Free Copies	750	749
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G. TOTAL (Sum of E, F1 and 2—should equal net press run shown in A)	69980	71342

11. I certify that the statements made by me above are correct and complete
Associate Publisher

PS Form 3526, Dec. 1987

Continued from p. 4

Now we're up to 14.275 and there's Glen Baxter K1MAN with his tapes that go on for what seems like hours, but he claims only last 45 minutes. Now he's bragging that he transmits his "bulletins" over 100 times a week. Oh, there, he's doing a commercial for *Radio Scan* magazine.

Above that, for the next 50 kHz, we find we're in the middle of what seems like a war. Hate, frustration, anger, bad language, jamming, more catcalls. Hey, this is a hobby?

So this is the best amateur radio has to offer, eh? This is their famous 20 meter band? Why, this is a sewer. This is disgusting! Why should some obviously deranged old men be permitted to waste such a valuable resource? What on earth is the matter with the FCC? How can they not close down this mess entirely and turn these incredibly valuable frequencies over to someone who has better use for them?

Well, let's give one more listen and see what we can find in between the DX pile-ups, the slow-scan porno and the total chaos above 14,275. Sure enough, there are some retired old men in there talking with each other. They're endlessly repeating their calls, a signal report, their "handle," a brief weather report, the make and model number of their transceiver and antenna, and a mention that sorry, they didn't get much of the last transmission due to QRM.

You know that in just a little over a year representatives of every country in the International Telecommunications Union will be meeting in Madrid to decide how to reshuffle the spectrum for better usage.

You also know that the Third World countries have little use for amateur radio. Few of the African hams are black. It's a white man's hobby... and most of the men who get on the air while visiting these countries ignore their laws, run illegal power, and even talk home via phone patches. Why should these countries be interested in giving up frequencies they need so a handful of old American men can waste them? Of what possible benefit is amateur radio to their country?

Your Job...

Let's see, as the ARRL president all you have to do is get amateur radio growing again, particularly by attracting youngsters; clean up the bad operating on our bands; and get the Third World countries to recognize how valuable amateur radio can be for them and thus protect our bands at the 1992 Madrid and 1993 Geneva WARCs. You're not going to do all this with something simple like a no-code license, that's for sure.

No, you're obviously going to have to mount a barrage of new programs. Worse, unless a bunch of new directors have been elected, you're probably going to have to fight around 13 directors for every program you want to initiate. On the other hand, you have some power at your command too. If you can get control of the Executive Committee you've got *QST* at your beck... and the IARU.

Now, the programs... it's going to take a bunch and you've got to get moving quickly.

Okay, first you'll have to get to work cleaning up our bands so we can be proud of them. We know the FCC doesn't want to get involved, so we're going to have to do this ourselves. Well, we're supposed to be self-policing anyway. We've always bragged to the FCC about this, so it's about time to live up to our billing.

One thing we do need from the FCC is a way to at least temporarily suspend the licenses of troublemakers... plus an immunity from legal harassment which might result. Could we make it a felony to sue over an amateur radio matter? I would prefer capital punishment, but I'd settle for a felony conviction.

The next move would be to set up a team at headquarters to organize the ARRL member clubs to get out there and bury the bad apples in suspensions.

The DX pileups can be cured, as I've mentioned before, just by limiting award credit to contacts made during contests. Once the DXCC and Honor Roll pressures are taken off, the pileups will blow away. This not only will clean up our bands enormously, it'll eventually result in us seeing thousands of hams getting on from rarer countries. This isn't going to hurt when the votes are counted at WARC.

Next we need to get back where we were 25 years ago and start attracting youngsters again. Hundreds of thousands of youngsters, not just the dozens we're getting now.

There's no easy fix on this like there is for cleaning up our bands. Here we need another HQ team, dedicated to promoting amateur radio growth. This means organizing every member club in the project. It means helping them understand the importance of public relations... of making amateur radio visible and getting across to kids that it's fun. No kid should be able to get out of the fifth grade without knowing about how neat ham radio is.

Clubs need to get a newsletter helping them organize community communications efforts... for parades, races, walkathons and so on. They need to be prodded to get radio clubs started in an "adopt-a-school" program. They need coverage in the local newspapers, on radio and TV.

It isn't going to be easy prying kids away from TV, but it can be done. We have a lot to offer kids, but as long as they've never even heard of amateur radio, we aren't going to get far.

We need videos that explain the fun we're having and how little it can cost to get started. They need to know about repeaters, fox hunting, OSCAR, packet, QRP, etc. We might start to class action libel suits against TV or movie producers who depict hams as nerds. Of course they might claim truth as a defense, playing tapes of our 20m band.

"Why should these countries be interested in giving up frequencies they need so a handful of old American men can waste them? Of what possible benefit is amateur radio to their country?"

But What About WARC?

There's never been an attempt to get ham ambassadors to visit the leaders of Third World countries and explain to them how amateur radio can benefit them and their countries. All it would take is a couple retired hams with some time and a few thousand dollars in travel expenses.

Heck, I went to Jordan and talked His Majesty King Hussein into setting up amateur radio. You're not going to find a stronger supporter of amateur radio today than Jordan. If I can do it, so can the ARRL... and they should.

You just talk money, that's all. Third World countries have to pay through the nose to import technicians to help set up, operate and service communications, electronics and computer systems. These techs can cost $500 to $1,000 a day vs. a few dollars if they had some of their own people. So put ham stations in the schools, provide a teacher, and soon you'll have hundreds... and then thousands of young amateurs, all anxious to learn because it's fun. It works. Heck, it'll even work here. It used to before the League wiped out our school radio clubs with their "incentive licensing" proposal 25 years ago.

Yes, there's a lot to be done... but it's all do-able if you have someone with guts and drive as president. That you? You're going to have to draw straight lines, even if they bisect a few balky old directors.

Similar Situation

In 1969, when I spotted FM and repeaters as a possible way to help get amateur radio growing again after five years of losing newcomers, I went at it every way I could. I set up my own repeater so I'd know what I was writing about. I published hundreds of articles on the subject. I organized repeater conferences around the country to get clubs to cooperate and standardize channels. I published a monthly repeater magazine and a flurry of books.

It worked! Within two years repeaters were the biggest ham activity in the country and I'd generated a new $100 million industry.

When I saw the potential for the microcomputer in 1975 I started one magazine after another, organized industry meetings to set standards, put on a huge microcomputer industry show in Boston, established one of the first mass produced software companies, started some software retail stores (ended up with a 58 Softwaire Centers chain), and so on.

Right now I'm tackling the music industry. It's dominated by a cartel of six international megacorporations (owned by Sony, Mitsubishi, etc.) and I want to break their hold over some 5,000 independent music companies. I've got a long list of projects I've formed or am forming to do this. Each has to be profitable, but the end goal is to sell more independent music.

Wait'll you see all the ways I'm promoting the sale of indie music... via samplers in hotels, dance studios, restaurants, book stores, hi-fi stores, discount stores, etc. I've already started releasing samplers and I'm gearing up to crank out up to a dozen a monthl

Then there's my international talent hunt, looking for undiscovered performers who should be recorded... and will be on indie labels.

If you were to take over as president of the ARRL you'd be faced with one heck of a job, just as I was. But it would be a challenge and fun, just as it was for me. You have the tools you need to make it happen, all you have to do is organize and manage the many efforts it's going to take.

You'll be talking with the FCC Commissioners and selling them on what you want to do. That won't be hard because you'll be solving many problems for them... and helping to cut not only their aggravation, but saving them money. Further, by attracting youngsters to our hobby, you'll be laying the groundwork for a much stronger America in a few years. That Information Age stuff isn't hype; it's where the money is right now and where it's going to be even more concentrated in the future.

You'll have to get out and visit some Third World leaders to get this program started. It'll take a selling job, but you have so much to offer you aren't going to get many turndowns.

You're going to be the keynote speaker at every major hamfest and convention, whipping up excitement and cooperation. You're going to make videos to help sell member clubs on cooperating. You're going to have to find some good ham writers and set

them to turning out the needed support publications.

You're going to have to cultivate an atmosphere of cooperation at HQ. It isn't going to be easy, but you aren't going to get much done if everyone is tied up with internal politics . . . and afraid to say anything.

You're going to have to work with the *QST* editors to get the covers into the '90s and out of the '50s. Then you can put *QST* on the newsstands so it can help attract newcomers. I'd even plan on starting a newcomer's magazine, once the dam has been broken and we start seeing new blood.

Using determination and creativity, the president of the ARRL can change America's role in the next century, helping to get back our consumer electronic industries, reviving our research labs. The alternative is the gradual death of amateur radio in America.

Japan understands how critically important amateur radio is to their success in electronics manufacturing and research and how it's the powerhouse behind their financial power. This is the power that's made it possible for them to buy more and more of our entertainment industry.

Oh, You Don't Agree?

On what point don't you agree? Do you disagree that our bands need cleaning up? How about our need for growth? Our ham industry is down to 25% of what it was 25 years ago. You disagree that we need to attract youngsters? Or maybe that we can?

How about WARC? Heck, if you're an ARRL member you got a letter asking for money, citing a long list of the problems we face in Madrid in 1992. I think you're a sucker if you sent money. Many true believers will, no doubt.

I didn't bring up getting the National Traffic System onto packet instead of chugging along at around 10 wpm on CW. I didn't suggest organizing teams to be sent to emergency areas to set up communications centers . . . like in Saudi Arabia to handle welfare traffic for our military who are sitting in the hot sun with little to do.

How about sending teams to Jordan, Egypt and India to handle traffic for the thousands of refugees streaming into Jordan from Iraq?

When St. Lucia was devastated by a hurricane I sent *73* staffer Tim Daniel N6RK down with several trunks of ham gear. It helped to tide them over and we got a very nice commendation from the island governor. So where are the ARRL emergency teams when they're needed? Heck, even K1MAN and his blithering has been able to do better than the ARRL in helping with emergencies. Far better.

If you were president of the League, wouldn't you have a ball getting amateur radio going again? I know I would. But it's going to take guts, creativity, and world-class problem solving skills. It'll be fun, if you take it on.

ATV

Ham Television

Bill Brown WB8ELK
℅73 Magazine
Forest Road
Hancock NH 03449

The Mt. Washington DXpedition

On August 4, a group of enterprising hams ascended to the top of Mt. Washington, New Hampshire, to hook up the 146.655 repeater and to try for some real ATV DX. This 6,288-foot peak is the highest point in New England and provides 2 meter coverage from as far as Albany, New York, to the mid coast of Maine. It's also the home of the worst recorded weather in the world! Winds exceeding 238 mph have been recorded (just before the anemometer broke!).... Even on a hot summer's day it can be downright bone-chilling on the summit.

Mike WA1PTC drove his ATV-filled van up to the top, Cal WA1WOK brought along N1KK's 10 watt ATV station and headed up the mountain along with Mike N1CGF, Chan KA1OU and Vern N1CKX. Situated on top of the weather observatory, they installed the beam and hooked up their 10 watt ATV transmitter to provide New England with an afternoon of excellent video. They knew they were in a good spot when the first signal received was a P4 picture from the KA1AFE ATV repeater in N. Andover, Massachusetts, nearly 100 miles to the south.

Meanwhile, somewhere off the coast of Maine...I hauled my portable ATV station out to Monhegan Island. Situated 10 miles off the coast, the view from the base of the lighthouse provided a line-of-sight path to Mt. Washington (100 miles to the west). On a clear day you can actually see the peak's silhouette just after sunset. Assisted by Bob KC1MC, along with helpers Adam and Evan Cooke, we hauled everything up to the top of Lighthouse Hill.

Photo A. Working Mt. Washington from Monhegan Island, Maine. From left to right, Adam and Evan Cooke holding the portable ATV package.

After setting up, we gave the crew on Mt. Washington a call and got an immediate full-scale reply on 2 meters! Mike WA1PTC pointed the beam our way and provided us a bird's-eye view of the visitor's center with a P4 full-color picture complete with great subcarrier audio. My receive setup consisted of nothing more than a stock Radio Shack Pocketvision™ 23 LCD TV with its onboard whip antenna! Visitors to the lighthouse museum on the island were amazed to see the live pictures of the cog railway chugging up the side of Mt. Washington, complete with its whistle blowing.

We were also able to send a P2 picture up to the mountain with just 1 watt to a vertical ¼-wave whip. Jon WA2YVL in Freeport exchanged two-way P5 pictures with the Mt. Washington crew as well as with our station on Monhegan Island.

Tugboat TV

Jon WA2YVL is the captain of a large ocean-going tugboat. Every two weeks he heads out on a two-week journey up and down the Eastern Seaboard with a large barge in tow. On October 4 he set sail from Providence heading towards Delaware. He brought along a 1 watt ATV station and

Photo B. Bill WB8ELK receives the Mt. Washington signal with his portable LCD TV (Monhegan Island).

transmitted a signal on 426.25 MHz in hopes of stirring up some activity. His antenna is mounted 90 feet above the water on a mast above the bridge. Bob WA1WVJ from West Haven, Connecticut, first saw him on the morning of October 5. Even though the tugboat was over 70 miles to his south, and shooting over a good part of Long Island, he was P3 to P4. The tugboat signal was even able to access the W1NRE ATV repeater in West Haven as well. A few days later on the return trip from Delaware, Jon was rewarded with successful ATV contacts at distances up to 100 miles away thanks to a band opening. John WA1IAO in northern Connecticut received a P2 picture at times, Dave WA1UQC and Fran N1GAU both received the signal near the Hartford area. WA1WVJ started receiving the tugboat transmission at 9 a.m. and could see him all day long as the boat travelled up to Block Island, over 50 miles away.

Jon plans to add a live camera to his station on the next couple of trips and may be covering different areas of the East Coast, possibly as far north as Portland, Maine. Anyone seeing his signal should give him a call on 144.34 MHz. If you'd like to find out his schedule, drop him a line via packet radio. His packet address is WA2YVL @ K1RQG.ME. Also, we will announce his schedule and location during the weekly ATV net on 3.871 MHz at 8 p.m. eastern time.

You never know just where Jon will end up in his journeys up and down the coast. At the time of this writing he's in New Haven harbor having a great time working W2WOD, KB2BUA, WA2FNQ and KA1DBS.

Since band enhancements occur somewhat frequently along the seacoast, Jon thinks it may be possible to work stations from Maine to South Carolina with a good opening from his seafaring vantage point. If anyone sees the tugboat signal, you can QSL to Captain Jon Andrews WA2YVL, P.O. Box 357, So. Freeport, ME 04078-0357.

Photo C. Tugboat ATV.

Photo D. Jon WA2YVL at the helm of the ATV tugboat.

Number 28 on your Feedback card

73 INTERNATIONAL

Arnie Johnson N1BAC
103 Old Homestead Hwy.
N. Swanzey, NH 03431

Notes from FN42

Winter in New England is upon us again. We have moved past a very beautiful fall foliage season with leaves in shades of red, gold, brown, yellow, and orange. Those of you who have not seen New England in October should try to visit then.

You can enjoy a late afternoon and night on Friday, and a whole day on Saturday, at the Hosstraders Ham Fleamarket at the Deerfield Fairgrounds in Deerfield, New Hampshire. The fall date has stabilized on the first Saturday in October, and the Spring Edition is the first Saturday in May. It is said that the best deals happen on Friday night.

You can also enjoy the New England ARRL Conference and ham fleamarket at Boxboro, Massachusetts, the second weekend in October. This year the weather was wonderful at Deerfield, but Boxboro was deluged by rain from the remnants of two hurricanes.

At Deerfield, I had the great pleasure of meeting our Hambassador from Kenya. Imagine my surprise when I looked up from my selling table and saw a name tag with Rod 5Z4BH on it! Rod Hallen was back in the United States for a conference. He had heard about a "small ham flea market" and he decided to attend. There were over 5,000 paid admissions. The entire proceeds went to the Shrine Hospital Burn Clinic in Boston.

Rod and I had a very nice chat, and he informed me that he has extended his stay in Kenya for one more year so we will have the pleasure of his informative observations and news from Kenya for another year. "It's a small world, Part II," took place at the same table when one of the hams I was selling with, Dave N2GE, came over and reintroduced himself to Rod. Dave had been in Kenya during the summer and had met Rod at the embassy. Unfortunately, this was the one day I didn't take my camera with me, so I couldn't get a picture of Rod for this column.

I have had a very rewarding and satisfying year with 73 Amateur Radio Today *and "73 International." The news from our Hambassadors has been timely and interesting. But we've lost a few of our past Hambassadors along the way. I feel this is an appropriate time to recognize those who have contributed so much during the past year, and make a plea to our readers for volunteers to increase our staff of Hambassadors.*

If you do not see your country represented in the following list of Hambassadors and wish to volunteer, please drop me a note at the address above or the address of the magazine. You can also reach me through the 73 BBS. (See the "Table of Contents" page.)

Your written skills in English do not need to be perfect. That's what I am here for. But I am not perfect, either, so that is why Wayne hired wonderful people like Linda, Hope, and Joyce, to keep the rest of us straight. Don't be afraid. WE NEED YOU!

You will never get rich in the publishing business (ask Wayne), especially by becoming a Hambassador. The pay is a **FREE** *airmail subscription to* 73 Amateur Radio Today *as long as you submit timely information three to four times a year. The rewards are seeing your name in print AND knowing that the rest of the world is made aware of the newsworthy ham events happening in your country.*

As a matter of fact, I just received a letter from a ham in Bulgaria who wishes to become a part of 73 Magazine. *Keep an eye out for offerings from Milen Postadshieff LZ2MP. His address appears in this column for those who wish to communicate with him.*

This is a holy time for many religions, and it's the end of the present year and the beginning of a new year. I am sure that I can speak for our 73 Hambassadors when I pass to all the best of wishes for the holy season and the coming new year. May there be peace and prosperity to all, and may all hams in all nations make the world a better place to live.

And now, the list of 73 Hambassadors who have submitted information during 1990.—Arnie, N1BAC ■

Australia
Ken Gott VK3AJU
38A Lansdowne Road
St. Kilda, Victoria 3183
Australia
"Silent Key"

Brazil
Carlos Vianna Carneiro PY1CC
Afonso Pena, 49/701
20270 Rio de Janeiro
Brazil

Bulgaria
Milen Postadshieff LZ2MP
PO Box 237
7000 Russe
Bulgaria

Cyprus
Aris Kaponides 5B4JE
PO Box 1723
Limassol
Cyprus

Hong Kong
Phil Weaver VS6CT
Flat 39C Two Park Towers
1 Kings Road
Hong Kong

Israel
Ron Gang 4X1MK
Kibbutz Urim
D.N. Hanagev 85530
Israel

Kenya
Rod Hallen 5Z4BH
Box 55
APO New York 09675

Republic of Korea
Byong-joo Cho HL5AP
PO Box 4, Haeundae
Pusan 612-600
Republic of Korea

Liberia
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1000 Monrovia 20
Liberia, West Africa

Lithuania
Jonas Paskauskas LY2ZZ
PO Box 71
Siauliai, 235400
Lithuania

Mozambique
Phil Gray KA7TWQ
c/o CARE, C.P. 4657
Maputo
Mozambique

New Zealand
Des Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

South Africa
Peter Strauss ZS6ET
PO Box 35461
Northcliff ZA-2115
Republic of South Africa
"Silent Key"

Spain
Woodson Gannaway N5KVB/EA
Apartado 11
35450 Santa Maria de Guia
(Las Palmas de Gran Canaria)
Islas Canarias, Spain

Sweden
Rune Wande SM0COP
Frejavagen 10
S-155 00 Nykvarn
Sweden

Union of Soviet Socialist Republics
Gennady Kolmakov UA9MA
PO Box 341
Omsk–99
USSR

Dx

Number 29 on your Feedback card

Hams Around the World

Bob Winn W5KNE
c/o QRZ DX
P.O. Box 832205
Richardson TX 75083

The Colvins

Lloyd and Iris Colvin, W6KG and W6QL respectively, are on the DXpedition trail again. The first two operations of this six-month DXpedition, they signed 5HØOL and 7Q7KG. They usually remain at each location for three or four weeks. They'll return home in March. Contacts with the Colvins count for the YASME Award. For all of their operations, QSL via YASME, P.O. Box 2025, Castro Valley CA 94546.

VP8WW and XU1DX—Pirates?

There is considerable doubt that the September operation by VP8WW was legitimate. The operator gave his location as South Georgia and said to OSL via G3HWW. G3HWW is the callsign of the York Amateur Radio Society, and the secretary of the society knows nothing about VP8WW! Thanks *DX News Sheet* et al.

JA1NUT notes that the recent operation by XU1DX was not legitimate. The only operator currently active from Kampuchea/Cambodia is Sokun, who operates XU8DX. She is not proficient at CW and seldom operates the mode.

CEØ San Felix

Weak rumors mention the possibility that one of the members of the military garrison may be an amateur radio operator, with expected arrival around January 1, 1991.

Leningrad International Hamvention

Plans for next year's convention in Leningrad, to be held the first week in August 1991, are underway. Further details may be obtained by writing to Amateur Radio Center Inter-Radio, P.O. Box 73, Leningrad 196070, USSR.

QSL Notes

T3ØBC. ZL2QW is not the QSL manager for Henry T3ØBC. She has not received logs from Henry since April. The new manager is K7EHI.

QSL manager WN5K, due to sickness in the family, is no longer the QSL manager for *YS1OD, YS1MAE, VP5LJ, VP5DG, VP5HG, VP5HL* and *VP5JD*. The last six stations will find stateside managers, but cards for *YS1OD* should be mailed to the *Callbook* address. Thanks WN5K.

HSØB, HSØM, HSØSM and HSØAC QSL cards now go to NY2E. Note that NY2E has a new address: Ray Riker, 433 Palo Alto Drive, Palm Springs FL 33461. WA4BCQ is ill and can no longer handle these cards. Thanks NY2E.

KC4AAA Antarctica. Bob NC6J has informed the ARRL that he can only confirm contacts for this station for the period August 1988 through October 1989. The new support group operating there now won't send him the logs. Bob suggests the following QSL route: Antarctic Support Assoc., 61 Inverness Drive East, Suite 300, Englewood CO 80112. Thanks NJ1Q of the ARRL.

7Z1AB Saudi Arabia. There are several QSL routes for the American Embassy station in Saudi Arabia. For operators Rick (N6TRE), Dirk (WB3ZIZ) and Dau (DL7ALC) QSL via WB2WOW. Cards for operator Don KS9F go to WA1S.

XU8DX. JA1NUT can only confirm contacts made after April 19, 1990. Contacts made with YL Sokum made before that date should be sent to F2YS/W2.

QSL Routes

1Z9ØCW	A pirate! Don't QSL via KA6V/7.
4K4QQ	via RA1QQ's 1990 *Callbook* address
4K4/UA6WCG	via I8YRK
4U1ITU	circa Sept. 11, 1990: USA via AA6MC; Europe via GØMFO
5HØQL	via YASME (see 7Q7KG)
5T5HH	H. Hourton, Box 1172, Nouakchott, Mauritania
5V7SA	RTTY via KB8BS; other via WB4LFM
7P8EN/P	via ZS58K
7O7KG	YASME, P.O. Box 2025, Castro Valley VA 94546
7Q7XB	via LA7XB
7Z1AB	For operators Rick (N6TRE), Dirk (WB3ZIZ) and Dau (DL7ALC) via WB2WOW. For operator Don (KS9F) OSL via WA1S.
8P9HR	via K4BAI
8R1/W1CDC	via AB1U
9H1XX	via DL2GBT
9H3CT	via VS6CT
9J2AL	Should be ORT. OSL via bureau ONLY, to WDØHHM.
9N1NFO	via WB4NFO
9Q5PL	Peter Laschan, Koernerstr 13, A-6020 Innsbruck, Austria
A35KB	Box 1, Nuku'alofa, Tonga
AI5P/WJ4	via AI5P
AY9F	via LU6FHF
BY4RSA	Box 538, Nanking, People's Republic of China
C3ØCAG	Willy Petit, Rue Jules Valles, BT E No. 1 F-76920 Amlreville La Ml Voie, France
CR1BI	via CT1CQK
ED1ISI	via EA1ANE
ED5IPE	via EA5GEO
F2JD/CE7	via F8AJA
FP/VE1DXX	via VE1AL
FR5CN	via FR4CN
FWØDD & FWØET	Sam Torope, Box 3040, Noumea, New Caledonia
G9GWA/	via GØGWA
G4WYG/ST4	via G4OHX
GB5ØBOB	To GØKUC via RSGB bureau
GXØANT	via G4XTA
GS6UW/P	via G3ZAY
GX6UW	via G4BAH
HL3ØAP	via HL5AP
HSØE	via K9EL
J2ØX	via F2VX
J73BM	Marcus Bristol, Box 245, Dominica
JT7ØSH	P.O. Box 1127, Ulan Bator, Mongolia
JWØGB	via WB4ZBI
KBØFUE/DU3	PSC 5, Box 10558, APO San Francisco CA 96410 USA
KC6CW	via JA2NOG
KC6DX	JH2BNL, Yuji Wada, P.O. Box 73, Sekishi 431-31, Japan
KC6EE	via LA1EE
KC6GV	via LA2GV
KH2I/KHØ	via JK1KRS
LX2PA	via PA3DKC
LZ5M	via LZ1RU
LZ5Z	via LZ1KDP
N6BUV/KHØ	via WD6DNE
OD5YU	Box 8, Tripoli 604, Lebanon
OHØBT	via DL4DBR
OH2AQ/OJ9	via OH2BVF
ON4USA/P	via ON5PL
OY3QN	via OZ1ACB
P29NEP	Nathan, P.O. Box 789, East Highlands Province, PNG
P29SC	via WB1GWB
PAØGAM/ST2	via PAØGIN
PA3FAC/SU	via PA3FAC
PJ6/WS4E	via WS4E
PY1QN/PV8	via PY1QN
RØAJ	via UZØJWA
R1SO	via RA3YF (see this issue)
RA3YF	Vladimir Scherbakov, Box 27, 241000 Brynsk, USSR
RLØP/KA6ZYF	P.O. Box 14Ø9, Santa Monica CA 90406-1489
RO9W	via UQ1GWW
RY1B/UW3SG	P.O. Box 1161, 460051 Orenburg, USSR
S79NBD	via JG1NBD
SO3HRA	via DJØIF
STØYD	via F6AJA
ST2YD	via F6AJA
SVØHS	via DJ8MT
T32HK	via JL3UIX
TM1BRE	(CW) via FB1MUX; (SSB) via F6GMB
TO8ONR	via F6ELE
TR8RY	via FF6KGU
TU2UI	via WA8ZWR
U9W/KA6ZYF	see RLØP/KA6ZYF
U9W/W6/G3MHV	see RLØP/KA6ZYF
UA6U/VE6JO	via VE6JO
UL7P/G3MHV	see RLØP/KA6ZYF
UM8QDX	Box 1, Kadzhi-Sai 722452, Kirghiz, USSR
UW2F	via UA2FM
UW4HM/RL4L	Box 8267, Kuibyshev 4443067, USSR
V31BB	via Gordon Silverman, N3ADC, 77 Homestead Road, Levittown PA 19056-1349
V47NXX	via KB2XR
V51B1	via DF2AL
V63AN	via JA2NOG
V63AR	via JA2BNL (see KC6DX)
V73BL	via WB4CSK
VP2V/N5XX	via N5XX
VP5VAA	via WS4E
VO9TB	Tom Benton, P.O. Box 55, FPO San Francisco CA 96685 USA
WA8ZNM/HH2	Alvin Blevins, Ø090 15th St. E., Sarasota FL 34243
WB4CSK/KH6	via WB4CSK
XE2XSQ	via K5TSO
XX9XJ	Two routes mentioned: K6JJ and K6JJE; neither call is in the 1990 *Callbook*.
Y9ØANT	via Y21RO
YEØK	P.O. Box 77, JKWB, Jakarta 10270, Indonesia
YJØAMH	via KF7PG
YN1CC	José says via Box 2971, Managua, but W3HNK says via W3HNK
YS1HUKE	via N8FU
ZD8S	via AKØM
ZD8Z	via W6CF
ZF2NE/ZF8	via W8ASP
ZF2PM	via NE4L
ZF2PN	via NE4L
ZM7AMO	via ZL1AMO
ZS6ØPTA	via ZS6TB
ZW9JR	via PP5JR
ZY8BI	via PY8BI

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BARTER 'N' BUY

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73 Flea Market*, Barter 'n' Buy, costs you peanuts (almost)—comes to 35c a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to the *Barter 'n' Buy*, Donna DiRusso, Forest Road, Hancock NH 03449 *and get set for the phone calls.*

HAM RADIO KITS & ASSEMBLIES for various *QST* & *73* construction articles. We also offer books and electronic components. For catalog, send legal size SASE w/45c postage or $1.00 to A & A Engineering, 2521 W. LaPalma #K, Anaheim CA 92801. BNB259

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SATELLITE MONTHLY AUDIO CODES 1 (900) HOT-SHOT intended for testing only. $3.50 per call. BNB938

CODE RTTY Send-Receive Disk VIC-20, C-64, send $5. Tape $6. Codeware, Box 3091, Nashua NH 03061. BNB940

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WANTED IBM-PC/CLONE AND PACKET equipment for Russian amateur emergency radio service—tax deductible. Dave Larsen KK4WW, PO Box 341, Floyd VA 24091. (703) 763-3311/382-4458. BNB945

WANTED: Manuals (including schematics) for LAFAYETTE SIGNAL GENERATOR TE-20. Meyer Minchen AG5G, 4635 SW FWY, Houston TX 77027. (713) 622-6161. BNB952

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WANTED: Your help donating IBM-PC clone, technical and callbooks for IARN emergency radio service in USSR. I will personally deliver equipment to UB5WE. David Larsen KK4WW. (703) 763-3311. BNB957

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PRINTED CIRCUIT BOARDS for projects in *73, Ham Radio, QST, ARRL Handbook*. List SASE. FAR Circuits, 18N640 Field Ct., Dundee IL 60118. BNB966

AUTHORIZED AMIGA & COMMODORE Service Center. Send SASE for price list. Callander Electronics, PO Box 363, Bakerstown PA 15007. BNB971

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HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston TX 77083

Packet via Satellites

Packet via amateur satellites has been around since the early days of packet radio activity. Even before the first ARRL Amateur Radio Computer Networking Convention in 1981 at the National Bureau of Standards in Gaithersburg, Maryland, AMSAT earmarked Special Service Channels (SSCs) for packet communications on future high-orbit satellites. Dr. Hank Magnuski KA6M, designer of one of the first packet digipeaters, was in charge of setting standards for SSC use. This came at a time when AMSAT was still recovering from the loss of Phase 3 A, which was to have been the first high-orbit, long-life hamsat. Phase 3 A met a watery end when its Ariane launcher failed to achieve orbit in early 1980.

Packet operation through analog satellite transponders is comparable to direct user-to-user packet procedure. Early tests were made at 1200 baud, but activity at 300 baud using HF modems was more reliable due to the weak-signal nature of satellite communications at the time. The use of the analog transponder space for packet experiments was never popular, though. The store-and-forward potential of the AX.25 protocol was not addressed via the transponder medium. A digipeater in space, or some other digital mailbox system for handling packets, was needed.

Determining the Standards

At the 1983 ARRL Amateur Radio Computer Networking Convention in San Francisco, California, Phil Karn KA9Q presented the paper, "Modulation and Access Techniques for PACSAT," and Don Connors KD2S presented "The PACSAT Project." Don's paper described the design goal of "total global access by all hams to a store-and-forward packet message handler" via satellite systems. He explained the need for packet satellites and described the on-board systems and technical parameters for all satellite subsystems.

Phil's paper on modulation techniques, when viewed with Don's, laid down the blueprint of today's Microsats from frequency choices to modulation methods. It was obvious that a form of phase-shift keying (PSK) would work better than standard audio-frequency-shift keying (AFSK) on an FM carrier for packet-satellite downlinks, and that is what we have today.

AFSK-FM has advantages that include low cost, simplicity, and easy Doppler tracking, but it has some serious disadvantages. These include inefficient bandwidth use and poor noise performance.

The UoSAT-OSCAR-11 FM downlink requires 15 kHz to support a 1200 baud signal, while a PSK signal with the same bandwidth could easily carry 9600 baud. AFSK-FM exhibits a sharp noise threshold at a relatively high carrier-to-noise ratio. Problems with impulse noise are also evident. Anyone who has been active with VHF packet has noticed that even strong signals are difficult to copy when powerline and auto ignition noise get into the received signal.

Other concerns with satellite downlinks include fading and polarization losses due to spacecraft rotation and orientation with respect to the ground observer.

The DCE Experiment

In 1984 when U-O-11 went to orbit, it carried the Digital Communications Experiment (DCE) which provided a proof-of-concept testbed for PACSAT work. The experiment continues to act as a mailbox in orbit to test digital communication software and provide data on hardware survivability, current consumption, and operational behavior in space. Only a small number of hams around the world are active as gateway stations through the DCE, but others can route their messages to these gateways for uplinking to U-O-11. Messages can sometimes be seen between telemetry frames on the 145.825 MHz FM downlink at 1200 baud.

When Fuji-OSCAR-12 was launched in August 1986, hams had their first opportunity to find out what PACSATs were all about. Whenever the mode "J" (2 meters up and 70cm down) digital transponder was active, stations could access the mailbox and leave messages for hams on the other side of the world. Signals were good, but battery problems made continuous activity impossible. After only a day or two the system needed recharging, with corresponding down periods and loss of all the messages in memory. Even with these problems, the open mailbox was an exciting packet experience.

Fuji-OSCAR-20, launched in February of this year, is experiencing similar difficulties, but this time they are related to temperature problems. The satellite is too hot. High current consumers like the digital system must be shut off for long periods to keep the internal temperature at a reasonable level to avoid serious battery damage. Schedule announcements from the JARL (Japanese ARRL counterpart) have provided some relief to those stations listening for the satellite.

Today's Packet Satellites

In January 1990, an Ariane-4 rocket placed four AMSAT-built Microsats into a nearly perfect sun-synchronous orbit at 800 km. The satellites, nine inches on a side, all carry similar payloads of packet and scientific experiments. All of this group of Microsats have store-and-forward capability, with two of the four carrying packet communications as their primary payloads. The other two are for more educational purposes and include a charge-coupled-device (CCD) camera for Earth imaging and a digital speech synthesizer.

In addition to the packet communications systems, the Microsats incorporate highly efficient solar panels, innovative power supply designs, VHF and UHF transmitters with DC to RF efficiencies as high as 76 percent, and computers using 1.3 micron surface-mount technology (SMT) devices with 8 megabytes of memory that use only about half a watt. All of this (batteries included) goes into a nine-inch cube weighing less than 22 pounds.

The packet systems are primary to AMSAT-OSCAR-16 and LUSAT OSCAR-19. They each have five uplink receivers and two downlink transmitters. While all receivers are on simultaneously, only one transmitter per satellite is usually active for packet downlinking. A complete frequency chart of uplinks and downlinks can be found in the May 1990 "Hamsats."

While the objectives of DOVE-OSCAR-17 and Weber-OSCAR-18 differ from the store-and-forward objectives of the other two satellites, they offer exciting possibilities to those with educational interests.

Microsats are small and light because it costs 16 times more per pound for AMSAT to get their payloads into orbit now than it did five years ago. A $20,000 satellite launch in 1985 would cost $320,000 today. Interest in the Microsat or lightsat concept has heightened in recent years. As the world becomes aware of the potential of the small or "micro" satellite, AMSAT finds itself competing for launch space once filled with ballast and nearly free for the asking.

Just after the launch of the Microsats, a background paper for Congress became available. Entitled "Affordable Spacecraft: Design and Launch Alternatives," it covered several different ideas on satellite construction from "lightsats" to "fatsats" and from simple devices to highly complex and compact designs. You can order a copy from the Superintendent of Documents, Government Printing Office, Washington, DC 20402-9325, for $2.25, shipping included. Ask for GPO stock number 052-003-01174-3.

Easy Packets from Space

D-O-17 transmits standard packet using AFSK-FM on 145.825 MHz. It is the perfect place to get started with satellite packet activity. Typical power levels from the satellite provide a 10 dB improvement over U-O-11 signals and can be heard on almost any antenna. Anyone who is currently active on VHF packet can hear the signals and see the resulting raw telemetry and messages on their CRT or other display device.

For those who can capture the data to disk, programs are available to decode the data and display information on the satellite's activities and health. One program found on many bulletin boards is NK6KTLM. It is usually listed as NK6KTLM.ARC (for archived). After "un-arc'ing" the file, the "readme" document explains how to activate the easy-to-use program. Fifty-seven channels of data can be decoded and examined with this program.

Photo. WEBERSAT's view of the sun. Taken on 8/15/90 at 0508 UTC. Photo courtesy of Weber State College.

Picture Packets from Space

W-O-18 takes snapshots of the Earth near the equatorial regions and sends them to Earth in packet form on 70cm.

The picture information is stored on the satellite in digital form and sent on one of the 70cm PSK transmitters. It's not sent pixel-by-pixel; two good passes are needed to collect a complete image. On one pass, odd-numbered lines are sent, and on the next pass, the even-numbered lines. When data from two subsequent passes are received and merged, a complete image can be put together. Any gaps that occur can be filled with values from adjoining pixels to make a clean picture.

Each day the satellite typically sends data for one picture, allowing Earth stations four to six opportunities to collect enough data to build a complete picture.

To capture and display the images, you need a PSK modem in conjunction with a standard packet terminal node

controller (TNC). Several modems have been described in recent "Hamsat" columns. They include the G3RUH unit available in kit form from Radiokit, the TAPR kit from the Tucson Amateur Packet Radio Corporation, the PacComm Microsat PSK modem from PacComm, the DSP-12 Multimode controller from L.L. Grace, and the Microsat Demodulator as described by W6OIJ in the September 1990 issue of *QEX*. A receive system capable of operation at 437 MHz SSB with digital frequency control from the PSK modem is needed. Finally, to complete the system, you need an antenna (omni is fine), a PC compatible computer with EGA or VGA graphics, and appropriate software.

The most commonly used data-collection software is TLMDC version 3 by N4HY. Like NK6KTLM for DOVE decoding, you can find it on many BBSs.

First the TNC is put in the KISS mode by sending it the command KISS ON followed by RESTART. Then TLMDC is run according to its "readme" document. Normal data and messages are displayed on the screen while a raw-data file is collected and stored by the program during the course of a pass. Upon exiting the program, a second program is needed to read the raw-data file and display the results.

WEBERWARE 1.0 from Weber State University is available from AMSAT and is currently the best system for picture display and manipulation. This collection of programs allows the user to change parameters of the viewed image, merge in other passes of the same picture, fill mixed pixels, print the results in black-and-white, or colorize the scene according to colorburst information sent with the picture file from the satellite. To get the TNC back to normal operation, it may be necessary to give it a hardware reset by turning it off and disconnecting the back-up battery.

W-O-18 is also capable of receiving and storing an image from Earth. It has a 1265 MHz receiver for standard amateur television (ATV) reception. On commands from the control station in Ogden, Utah, it can take a snapshot of a picture sent from an Earth station and retransmit it via the packet system. Early experiments with this scheme have demonstrated that very high-power or high-gain antennas on the ground are needed for picture uploads.

SAREX 2 Update

NASA officials were forced to scrub the launch of STS-35 on September 11, 1990 due to another hydrogen leak in the rear engine compartment. The next opportunity for *Columbia* and the Shuttle Amateur Radio Experiment is in early December. AMSAT will once again publicize the frequency plans and schedule information for the mission as the launch approaches. Check the May 1990 issue of *73* for background information.

Number 18 on your Feedback card

UPDATES

DXDA Corrections

See the October '90 issue, page 80. Saipan and Rota Island should both be KH0, not KH2. These are the only two corrections. Mariana Island and Tinian, also KH0, are correct as listed. Guam is correctly listed as KH2. *TNX Paul Swartzendruber K4EQY, in KH0-land for calling us.*

ROBO-COPY

See the above article in the Oct. '90 issue, page 28. Mike Hansen WB9DYI: "Thanks to input from readers, I've verified that there are two errors in the pin selection/software version for the signal input to ROBO-COPY. These errors affect SOME but not all pin selection/software combinations. If you are not getting any response from ROBO-COPY once the main screen appears, one of the following fixes should cure the problem.

"For software downloaded from the *73* BBS prior to October 16: The version of the software labeled ROBO.EXE uses the 'DCD' (data carrier detect) signal for input, *NOT the 'RI' (ring indicator) as stated in the article.*

"FIX 1: Move the signal input from the 'RI' pin to 'DCD.' The correct signal input pin for the ROBO.EXE version is pin 1 on a DB9 connector and pin 8 on a DB25.

"FIX 2. Download the updated software version ROBO2.EXE from the *73* BBS. Check to make sure that the signal pin is indeed 'RI.' The 'RI' pin is number 9 on a DB9 and pin 22 on a DB25. *Note that 'RI' for the DB25 type connector is stated incorrectly in the article.* The DB9 pin number is listed correctly. There are no other differences between ROBO.EXE and ROBO2.EXE except the pin selection changes.

"For software received directly from WB9DYI: The only software version sent through the mail is ROBO2.EXE, even though it is labeled ROBO.EXE. You may want to rename your copy to match the new name. Check to make sure that the signal pin is indeed 'RI.'

"I'm sorry for this mix-up. I changed computers during the final stages of the ROBO-COPY check out and must have archived the wrong version of the software." *TNX WB9DYI.*

New Kenwood Warranty

Kenwood announces a new warranty program for all new amateur radio products purchased in the United States. Effective October 1, 1990, all new Kenwood transceivers, receivers, accessories, and options carry a full one-year warranty from the date of purchase.

New warranty cards are being issued for existing dealer stock, but they may not be available initially. A sales receipt dated on or after October 1, 1990, is the only documentation necessary for warranty claims. Additional information is available by mail from Kenwood USA Corporation, Amateur Radio Customer Service, P.O. Box 22745, Long Beach CA 90801; by phone at (213) 761-7140; or via the Kenwood BBS at (213) 761-8284 (2400 baud max, 8 bits, no parity, 1 stop bit). Add this new warranty info to the Kenwood service article by WB6NOA in the April '90 issue. *TNX, Kenwood, for the bulletin.*

Goof-Proof Goof

See "Goof-Proof Regenerative Receiver" in the Nov. '90 issue, page 35, Figure 4. The pans placement should indicate **Headphones** (if using the headphones-only option—in which case you don't need to build the LM386 audio amp section) where it shows Audio output. The 8 ohm speaker is attached where it shows **SPK**. . . de WB8ELK.

NANDs, not ANDs

See "TTL Transceiver for 40 Meters" in the Nov. '90 issue, page 30. Look at the "IC Layout" in the upper left corner of Figure 1. The little circles were left off the top of the symbol describing the type of gate, rendering them AND gates when they should be NAND gates. See the proper symbol in the figure. *TNX KB1UM for catching this.*

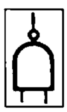

Figure. The little circle on top signifies that the gate is a NAND gate.

Number 32 on your Feedback card

RANDOM OUTPUT

David Cassidy N1GPH

Magic

My generation (thirtysomething) is the last generation that will be amazed by radio. The fact that I can sit in my bedroom and talk to some other person sitting in their bedroom on the other side of the globe still fills me with wonder. That, in a nutshell, is why I became a radio amateur. To this day, I still have a childlike feeling of awe every time I turn on a transceiver. Oh, I know *why* the whole thing works and I even have a pretty good grasp on *how* the whole thing works. I don't care about Marconi, the ARRL study guides or the FCC exam. I know that radio is magic!

Kids today grow up with magic. It has become commonplace. They have dozens of channels of cable TV piped right into their homes with no interference. They learn about computers before they learn to read. They don't realize that a computer is magic. They have never known a time when ordinary men and women didn't climb to the top of tall rockets and travel into space. It wasn't so long ago that a space launch was an international event. Now, the major networks don't even provide live coverage for space shuttle launches. Space travel is magic, and they don't even know it. And what about communication satellites? In a world where I can sit in my car (my *car!*) and talk to anyone, anywhere in the world on a telephone, what is the big deal about a bunch of old men sitting in their ham shacks? Radio is low tech. Even packet is a dinosaur when you compare it to what your average twelve-year-old can do with a Commodore 64 and a modem.

I feel sorry for today's kids because they don't have that magic. Even though I grew up in the age of television, it is personal communications by radio that has always fascinated me (what is television, after all, but radio with pictures?). I still remember vividly, as I'm sure most of you do, the first time I sat alone behind the key of a code rig and sent my own callsign. Somewhere in Texas another person sat by his code key and returned my CQ. There it was! My own callsign, coming over the speaker—coming out of thin air. It was magic.

I think kids today have lost that sense of magic. Sure, they can recreate the experience that most of us had—sitting behind a radio that glows in the dark, the smell of warm dust on the tubes, listening for that faint CQ. They can buy the old rigs and have a ball with them, but I don't think they have the same sense of amazement many of us experienced. Modern transceivers are great. They have all kinds of bells and whistles that we only dreamed of ten years ago. But still, don't you sometimes wish you had a radio the size of a Volkswagen sitting on your desk—all dials and knobs and meters—just sitting there, waiting for you to "throw the big switch"?

I know I sound like an old-timer grumbling about the "good ol' days," but all of this is leading up to something I'd like you all to consider.

The problem of getting young people interested in amateur radio has been talked to death. The reasons why kids never get involved in this great hobby are numerous and have been stated and restated to the point of redundancy. To be sure, there are a few bright spots. People like Carole Perry WB2MGP are actually doing something about it. (Do you realize that she teaches amateur radio to 400 students every semester? *Four hundred!* Not all of those kids get or keep a license, but can you imagine what would happen if only one school in every state could follow her example?) The fact remains that unless we figure out a way to market and sell amateur radio to kids, many of us will live to see the end of this hobby. Unless we have the numbers that demand attention, and the youthful enthusiasm to fight for the disproportionate amount of spectrum we occupy, it won't be long before amateur radio is reduced to repeater wars on 2 meters and two old men calling CQ DX on 20 meters (both on the same frequency, no doubt).

It all boils down to this: We have got to find a way to put the magic back into amateur radio. We have got to figure out a way to show young people that they can have a blast with this hobby. Do you think your average twelve-year-old wants to spend his Saturday afternoons sitting behind a desk saying, "You're 5-9, I'll QSL through the bureau," or "You're number 125—good luck in the contest," or "Rig is . . . antenna is . . . QTH is . . 73 and CUL." That's not magic! That's boring!

There are so many things about amateur radio that would fascinate a kid. Carole Perry has dozens of kids running around the halls of her school with little code practice oscillators that look like Star Trek communicators. These kids know a secret language—Morse code—and they think it's great. They know that radio is magic because they can hold the magic in their hands.

We published a letter a few months ago from a gentleman who was helping his grandchildren put together crystal radio sets. You give an eight-year-old a pile of parts, show her what to do, then watch her face as voices start coming out of something she has built herself. You won't have to explain to that eight-year-old about the magic of ham radio. She'll know it's magic. It's right there in front of her, and she did it herself.

Joe Fairclough WB2JKJ is the driving force behind the Junior High School 22 radio club in New York. He has taken a bunch of street kids from the toughest part of a very tough city and changed their lives. He is literally changing lives with nothing but amateur radio. You don't have to explain to his kids that radio is magic. They are living proof!

Do you remember what it was like, the first time you heard your very own callsign coming through the speaker? Did any of you feel you had the power of the universe right there at your fingers? Do you, oh patient reader, remember the magic?

Can we get the magic back . . . please? ■

Number 33 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
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A Few Good Days

Unfortunately, December is NOT predicted to be a particularly good month for DX on the high frequency bands. The "Good" days, indicated by "G" on the calendar, are expected to center around the 6th and the 16th; the "Poor" days, "P" on the calendar, center around the 10th and the 25th. All the other days of December trend from "Fair" (F) to "Poor" (P) or from "Poor" to "Fair."

Coupled with an unsettled-to-active magnetic field on the "Poor" days, you can expect early darkness in the Northern Hemisphere, with bands above 20 meters closing shortly before or after dark. The bands *below* 20 meters will likely be quite usable, even on the "Poor" days. You can expect DX across the equator, especially across the north pole into the USSR, during evening hours local time.

Winter solstice propagation on the higher HF bands of 20–10 meters is likely to be daytime only, with some short skip possibilities occurring on many days . . . but don't expect too much for 10 and 12 meters. Any DX you find will be a bonus. Some of the best DX opportunities may happen along the line of the terminator. The terminator is the path of advancing darkness in one half of the earth which corresponds to advancing dawn on the other half. Listen just before and after dark, and just before and after dawn.

I hope my gloomy forecast is wrong, and I'm looking forward to giving you a better one next month. Remember to monitor WWV at 18 minutes after any hour and look for LOW "A" index and HIGH solar flux reports for your best conditions. Trends are always helpful if you keep a log every day. The best of Season's Greetings to all of you. ■

EASTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20	-	20	20	-	20	20	-	10	-	15
ARGENTINA	15	[illegible]	[illegible]	[illegible]	-	-	-	-	10	10	10	15
AUSTRALIA	[illegible]	[illegible]	-	-	20	40	20	20	[illegible]	-	20	[illegible]
CANAL ZONE	15	20	20	20	-	40	-	10	10	10	10	15
ENGLAND	40	[illegible]	[illegible]	[illegible]	40	-	-	[illegible]	[illegible]	15	20	40
HAWAII	[illegible]	20	20	20	20	40	40	-	[illegible]	-	-	[illegible]
INDIA	-	20	20	-	-	-	20	15	-	-	-	-
JAPAN	15	20	-	20	20	-	20	20	-	20	-	15
MEXICO	15	20	20	20	-	40	-	10	10	10	10	10
PHILIPPINES	15	-	-	-	-	-	20	20	[illegible]	-	-	-
PUERTO RICO	15	20	20	80	-	40	-	10	10	10	10	10
SOUTH AFRICA	20	40	-	-	-	-	-	-	10	10	15	20
USSR	-	-	-	-	-	-	[illegible]	[illegible]	[illegible]	-	-	-
WEST COAST	[illegible]	[illegible]	15	40	40	40	-	-	[illegible]	15	10	10

CENTRAL UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	[illegible]	[illegible]	-	-	20	-	-	20	-	-	-	-
ARGENTINA	20	20	20	20	20	-	-	-	-	15	[illegible]	[illegible]
AUSTRALIA	10	-	-	-	-	40	40	20	[illegible]	15	15	15
CANAL ZONE	20	20	[illegible]	[illegible]	40	40	-	[illegible]	[illegible]	[illegible]	[illegible]	15
ENGLAND	40	[illegible]	[illegible]	[illegible]	-	-	-	[illegible]	[illegible]	[illegible]	[illegible]	20
HAWAII	[illegible]	20	20	20	[illegible]	[illegible]	40	20	-	15	-	[illegible]
INDIA	20	15	20	-	-	-	20	20	-	-	-	-
JAPAN	[illegible]	[illegible]	-	-	20	-	-	20	-	-	-	-
MEXICO	20	20	[illegible]	[illegible]	40	40	-	[illegible]	[illegible]	[illegible]	[illegible]	15
PHILIPPINES	15	[illegible]	-	-	-	-	-	-	20	20	-	-
PUERTO RICO	20	20	[illegible]	[illegible]	40	40	-	[illegible]	[illegible]	[illegible]	[illegible]	15
SOUTH AFRICA	20	[illegible]	-	-	-	-	-	-	15	[illegible]	15	15
USSR	-	40	40	20	20	-	-	15	10	20	-	-

WESTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	[illegible]	[illegible]	-	-	-	-	40	40	-	-	20	[illegible]
ARGENTINA	10	15	20	[illegible]	[illegible]	20	-	-	-	15	10	10
AUSTRALIA	10	20	20	-	-	-	40	-	-	15	-	-
CANAL ZONE	20	[illegible]	[illegible]	[illegible]	[illegible]	40	-	-	[illegible]	15	15	15
ENGLAND	-	-	-	40	40	20	-	-	[illegible]	[illegible]	20	20
HAWAII	15	[illegible]	[illegible]	20	-	40	40	-	-	15	15	15
INDIA	-	[illegible]	20	-	-	-	-	-	20	-	-	-
JAPAN	[illegible]	[illegible]	-	-	-	-	40	40	-	-	20	[illegible]
MEXICO	20	[illegible]	[illegible]	[illegible]	[illegible]	40	-	-	[illegible]	10	15	15
PHILIPPINES	20	15	-	-	-	-	-	-	20	20	20	15
PUERTO RICO	20	[illegible]	[illegible]	[illegible]	[illegible]	40	-	-	[illegible]	10	10	15
SOUTH AFRICA	20	20	20	-	-	-	-	-	-	10	[illegible]	15
USSR	-	-	-	40	20	20	-	-	15	20	-	-
EAST COAST	15	[illegible]	15	40	40	40	-	-	[illegible]	[illegible]	[illegible]	[illegible]

Notes: [illegible]

DECEMBER 1990

SUN	MON	TUE	WED	THU	FRI	SAT
						1 P
2 P–F	3 F	4 F	5 F–G	6 G	7 G	8 G–F
9 F–P	10 P	11 P–F	12 F	13 F	14 F	15 F–G
16 G	17 G	18 G–F	19 F–P	20 P	21 P	22 P–F
23 F–P	24 P	25 P	26 P	27 P–F	28 F	29 F
30 F–P	31 P					